

United States of America

DRAFT PROPOSALS FOR WRC-2000

Attached are the draft proposals of the United States concerning the 2000 World Radiocommunication Conference (WRC-2000). These draft proposals reflect deliberations in the United States as of September 13, 1999 and will be kept up to date as the our preparatory process continues.

The United States intends to take into account comments and views expressed by other administrations as progress in proposal development continues.

This document presents our draft proposals. Each of the individual proposals has been annotated, in the individual agenda title, to indicate the date of its last revision.

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Proposals for Agenda Item 1.2

to finalize remaining issues in the review of Appendix **S3** to the Radio Regulations with respect to spurious emissions for space services, taking into account Recommendation **66 (Rev.WRC-97)** and the decisions of **WRC-97** on adoption of new values, due to take effect at a future time, of spurious emissions for space services

Revision of Appendix S3 (13September99)

Background Information: Recommendation No. **66 (Rev. WRC-97)** directs the ITU-R to submit a report to **WRC-2000** with a view to finalizing the space services spurious emissions limits in Appendix **S3** of the Radio Regulations. The United States proposes text that would remove the “design objectives” designation from the space services spurious emissions limits and make related appropriate modifications applicable to deep-space systems, satellites with spurious emissions falling within the necessary bandwidth of another transmitter on the same satellite, and amateur earth stations below 30 MHz. Also the United States proposes to adequately recognize the case of very narrowband and unmodulated signals, particularly for the space services. Furthermore, the United States proposes to correct an oversight in Appendix **S3** regarding limits for the radiodetermination service, and to specify that spurious emission levels for radar systems be determined from radiated emissions.

Proposals:

APPENDIX S3

Table of Maximum Permitted Spurious Emission Power Levels

(See Article **S3**)

APS3

1. The following sections indicate the maximum permitted levels of spurious emissions, in terms of power as indicated in the tables, of any spurious component supplied by a transmitter to the antenna transmission line. Section 1 is applicable until 1 January 2012 to transmitters installed on or before 1 January 2003; Section 2 is applicable to transmitters installed after 1 January 2003 and to all transmitters after 1 January 2012. This Appendix does not cover out-of-band emissions. Out-of-band emissions are dealt with in No. **S4.5** of the Radio Regulations.
2. Spurious emission from any part of the installation, other than the antenna and its transmission line, shall not have an effect greater than would occur if this antenna system were supplied with the maximum permitted power at that spurious emission frequency.
3. These levels shall not, however, apply to emergency position-indicating radiobeacon (EPIRB) stations, emergency locator transmitters, ships' emergency transmitters, lifeboat transmitters, survival craft stations or maritime transmitters when used in emergency situations.
4. For technical or operational reasons, more stringent levels than those specified may be applied to protect specific services in certain frequency bands. The levels applied to protect these services, such as safety and passive services, shall be those

agreed upon by the appropriate world radiocommunication conference. More stringent levels may also be fixed by specific agreement between the administrations concerned. Additionally, special consideration of transmitter spurious emissions may be required for the protection of safety services, radio astronomy and space services using passive sensors. Information on the levels of interference detrimental to radio astronomy, Earth exploration satellites and meteorological passive sensing is given in the most recent version of Recommendation ITU-R SM.329.

5. Spurious emission limits for combined radiocommunication and information technology equipment are those for the radiocommunication transmitters.

**Section I. Spurious Emission Limits for Transmitters Installed on
or Before 1 January 2003 (valid until 1 January 2012)**

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6. Radar systems are exempt from spurious emission limits under this section.
~~The measurement methods for radar systems should be guided by Recommendation ITU-R M.1177. For those radar systems for which acceptable methods of measurement do not exist, the lowest practicable power of spurious emission should be achieved.~~

TABLE I
**Attenuation values and absolute mean power levels used to calculate
maximum
permitted spurious emission power levels for use with radio equipment**

Frequency band containing the assignment (lower limit exclusive, upper limit inclusive)	For any spurious component, the attenuation (mean power within the necessary bandwidth relative to the mean power of the spurious component concerned) shall be at least that specified below and the absolute mean power levels given shall not be exceeded (Note 1)
9 kHz to 30 MHz	40 decibels 50 milliwatts 2), 3), 4)
30 MHz to 235 MHz – mean power above 25 watts – mean power 25 watts or less	60 decibels 1 milliwatts 5) 40 decibels 25 microwatts

235 MHz to 960 MHz – mean power above 25 watts – mean power 25 watts or less	60 decibels 20 milliwatts 6), 7) 40 decibels 25 microwatts 6), 7)
960 MHz to 17.7 GHz – mean power above 10 watts – mean power 10 watts or less	50 decibels 100 milliwatts 6), 7), 8), 9) 100 microwatts 6), 7), 8), 9)
Above 17.7 GHz	The lowest possible values achievable shall be employed (see Recommendation 66 (Rev.WRC-97)).

Notes to Table I

¹⁾ When checking compliance with the provisions of the table, it shall be verified that the bandwidth of the measuring equipment is sufficiently wide to accept all significant components of the spurious emission concerned.

²⁾ For mobile transmitters which operate below 30 MHz, any spurious component shall have an attenuation of at least 40 decibels without exceeding the value of 200 milliwatts, but every effort should be made to comply with the level of 50 milliwatts wherever practicable.

³⁾ For transmitters of a mean power exceeding 50 kilowatts which can operate on two or more frequencies covering a frequency range approaching an octave or more, while a reduction below 50 milliwatts is not mandatory, a minimum attenuation of 60 decibels shall be provided.

⁴⁾ For hand-portable equipment of mean power less than 5 watts, the attenuation shall be 30 decibels, but every practicable effort should be made to attain 40 decibels attenuation.

⁵⁾ Administrations may adopt a level of 10 milliwatts provided that harmful interference is not caused.

⁶⁾ Where several transmitters feed a common antenna or closely spaced antennas on neighbouring frequencies, every practicable effort should be made to comply with the levels specified.

⁷⁾ Since these levels may not provide adequate protection for receiving stations in the radio astronomy and space services, more stringent levels might be considered in each individual case in the light of the geographical position of the stations concerned.

⁸⁾ These levels are not applicable to systems using digital modulation techniques, but may be used as a guide. Values for these systems may be provided by the relevant ITU-R Recommendations, when available (see Recommendation **66 (Rev.WRC 97)**).

⁹⁾ These levels are not applicable to stations in the space services, but the levels of their spurious emissions should be reduced to the lowest possible values compatible with the technical and economic constraints to which the equipment is subject. Values for these systems may be provided by the relevant ITU-R Recommendations, when available (see Recommendation **66 Rev.WRC-97**)).

Section II. Spurious Emission Limits for Transmitters Installed After 1 January 2003 and for All Transmitters After 1 January 2012

Application of these limits

7. The frequency range of the measurement of spurious emissions is from 9 kHz to 110 GHz or the second harmonic if higher.

8. Guidance regarding the methods of measuring spurious emissions is given in the most recent version of Recommendation ITU-R SM.329. The e.i.r.p. method specified in that Recommendation should be used when it is not possible to measure the power supplied to the antenna transmission line, or where it is more appropriate, due to the antenna signal attenuation characteristics. Additionally, the e.i.r.p. method may need some modification for special cases, e.g. beam-forming radars.

9. Guidance regarding the methods of measuring spurious emissions from radar systems is given in the most recent version of Recommendation ITU-R M.1177. The reference bandwidths required for proper measurement of radar spurious emissions should be calculated for each particular radar system. Thus, for the three general types of radar pulse modulation utilized for radionavigation, radiolocation, acquisition, tracking and other radiodetermination functions, the reference bandwidth values should be:

- for fixed-frequency, non-pulse-coded radar, one divided by the radar pulse length, in seconds (e.g. if the radar pulse length is 1 microsecond, then the reference bandwidth is $1/1\mu\text{s} = 1\text{ MHz}$);
- for fixed-frequency, phase coded pulsed radar, one divided by the phase chip length, in seconds (e.g. if the phase coded chip is 2 microseconds long, then the reference bandwidth is $1/2\mu\text{s} = 500\text{ kHz}$);
- for frequency modulated (FM) or chirped radar, the square root of the quantity obtained by dividing the radar bandwidth in MHz by the pulse length, in seconds (e.g. if the FM is from 1 250 to 1 280 MHz or 30 MHz

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during the pulse of 10 microseconds, then the reference bandwidth is $(30 \text{ MHz}/10\mu\text{s})^{1/2} = 1.73 \text{ MHz}$).

For those radar systems for which acceptable methods of measurement do not exist, the lowest practicable power of spurious emission should be achieved.

10. The spurious emission levels are specified in the following reference bandwidths:

- 1 kHz between 9 kHz and 150 kHz
- 10 kHz between 150 kHz and 30 MHz
- 100 kHz between 30 MHz and 1 GHz
- 1 MHz above 1 GHz

As a special case, the reference bandwidth of all space service spurious emissions should be 4 kHz.

11. For the purpose of setting limits, all emissions, including harmonic emissions, intermodulation products, frequency conversion products and parasitic emissions, which fall at frequencies separated from the centre frequency of the emission by $\pm 250\%$, or more, of the necessary bandwidth of the emission will generally be considered as spurious emissions. However, this frequency separation may be dependent on the type of modulation used, the maximum bit rate in the case of digital modulation, the type of transmitter and frequency coordination factors. For example, in the case of digital (including digital broadcasting) modulation systems, broadband systems, pulsed modulation systems and narrow-band high power transmitters, the frequency separation may need to differ from the $\pm 250\%$ factor. For multichannel or multicarrier transmitters/transponders, where several carriers may be transmitted simultaneously from a final output amplifier or an active antenna, the centre frequency of the emission is taken to be the centre of the -3 dB bandwidth of the transmitter or transponder and the necessary bandwidth is taken to be the transmitter or transponder bandwidth.

**USA/1.2/3
ADD**

11 bis As an emitted signal becomes more and more narrow (to the limiting case of an unmodulated carrier with theoretical necessary bandwidth of zero), the application of the term “necessary bandwidth” as used in determining the region where spurious emission limits apply to space services, becomes more and more difficult. In the limit, $\pm 250\%$ of necessary bandwidth (generally recognised as establishing the region beyond which spurious emissions are defined), approaches zero. Beacons and other unmodulated signals, such as those used in uplink and downlink circuits in control and tracking of satellites, are examples of a case where it is difficult to practically apply the term “necessary bandwidth” in determining where out-of-band emissions end, and spurious emissions begin. Pending further studies and definitive action by a future World Radiocommunication Conference, in calculating the region where spurious emission limits apply for transmitters using amplifiers to pass essentially an unmodulated signal (or a signal with very small bandwidth), the amplifier bandwidth is taken to be the necessary bandwidth (in calculating the regions where spurious emissions apply).

USA/1.2/4
ADD

11 ter For satellites employing more than one transponder, and when considering the limits for spurious emission as indicated by Headnote 11 to Appendix S3, spurious emissions from one transponder may fall on a frequency at which a companion, second transponder is transmitting. In this situation, the level of spurious emission from the first transponder is well exceeded by fundamental emissions of the second transponder. Therefore, limits in this appendix do not apply to those spurious emissions on a satellite which fall within the bands where there are transmissions from the same satellite into the same service area.

12. Examples of applying $43 + 10 \log (P)$ to calculate attenuation requirements

Where specified in relation to mean power, spurious emissions are to be at least x dB below the total mean power P , i.e. $-x$ dBc. The power P (in watts) is to be measured in a bandwidth wide enough to include the total mean power. The spurious emissions are to be measured in the reference bandwidths given in the Recommendation. The measurement of the spurious emission power is independent of the value of necessary bandwidth. Because the absolute emission power limit, derived from $43 + 10 \log (P)$, can become too stringent for high-power transmitters, alternative relative powers are also provided in Table II.

Example 1

A land mobile transmitter, with any value of necessary bandwidth, must meet a spurious emission attenuation of $43 + 10 \log (P)$, or 70 dBc, whichever is less stringent. To measure spurious emissions in the frequency range between 30 MHz and 1 000 MHz, Recommendation ITU-R SM.329-7 *recommends* 4.1 indicates the use of a reference bandwidth of 100 kHz. For other frequency ranges, the measurement must use the appropriate reference bandwidths given in *recommends* 4.1.

With a measured total mean power of 10 watts:

- Attenuation relative to total mean power = $43 + 10 \log (10) = 53$ dBc.
- The 53 dBc is less stringent than 70 dBc, so the 53 dBc value is used.
- Therefore: Spurious emissions must not exceed 53 dBc in a 100 kHz bandwidth, or converting to an absolute level, spurious emissions must not exceed $10 \text{ dBW} - 53 \text{ dBc} = -43 \text{ dBW}$ in a 100 kHz reference bandwidth.

With a measured total mean power of 1 000 watts:

- Attenuation relative to total mean power = $43 + 10 \log (1\ 000) = 73$ dBc.
- The 73 dBc is more stringent than 70 dBc limit, so the 70 dBc value is used.
- Therefore: Spurious emissions must not exceed 70 dBc in a 100 kHz bandwidth, or converting to an absolute level, spurious emissions must not exceed $30 \text{ dBW} - 70 \text{ dBc} = -40 \text{ dBW}$ in a 100 kHz reference bandwidth.

Example 2

A space service transmitter with any value of necessary bandwidth must meet a spurious emission attenuation of $43 + 10 \log (P)$, or 60 dBc, whichever is less stringent. To measure spurious emissions at any frequency, Note 1 to Table II indicates using a reference bandwidth of 4 kHz.

With a measured total mean power of 20 watts:

- Attenuation relative to total mean power = $43 + 10 \log (20) = 56$ dBc.
- The 56 dBc is less stringent than the 60 dBc limit, so the 56 dBc value is used.
- Therefore: Spurious emissions must not exceed 56 dBc in a 4 kHz reference bandwidth, or converting to an absolute level, spurious emissions must not exceed $13 \text{ dBW} - 56 \text{ dBc} = -43 \text{ dBW}$ in a 4 kHz reference bandwidth.

USA/1.2/5
ADD

TABLE II
Attenuation values used to calculate maximum permitted spurious emission power levels for use with radio equipment

Service category in accordance with Article S1, or equipment type¹⁵⁾	Attenuation (dB) below the power supplied to the antenna transmission line
All services except those services quoted below:	$43 + 10 \log (P)$, or 70 dBc, whichever is less stringent
Space services (earth stations) 10), 14) , 16	$43 + 10 \log (P)$, or 60 dBc, whichever is less stringent
Space services (space stations) 10), 14) , 17)	$43 + 10 \log (P)$, or 60 dBc, whichever is less stringent
Radiodetermination 14)	$43 + 10 \log (PEP)$, or 60 dB, whichever is less stringent
Broadcast television ¹¹⁾	$46 + 10 \log (P)$, or 60 dBc, whichever is less stringent, without exceeding the absolute mean power level of 1 mW for VHF stations or 12 mW for UHF stations. However, greater attenuation may be necessary on a case by case basis.
Broadcast FM	$46 + 10 \log (P)$, or 70 dBc, whichever is less stringent; the absolute mean power level of 1 mW should not be exceeded
Broadcasting at MF/HF	50 dBc; the absolute mean power level of 50 mW should not be exceeded
SSB from mobile stations ¹²⁾	43 dB below <i>PEP</i>
Amateur services operating below 30 MHz (including with SSB) ¹²⁾ , 16)	$43 + 10 \log (PEP)$, or 50 dB, whichever is less stringent

TABLE II (END)

Service category in accordance with Article S1, or equipment type ¹⁵⁾	Attenuation (dB) below the power supplied to the antenna transmission line
Services operating below 30 MHz, except space, radiodetermination, broadcast, those using SSB from mobile stations, and amateur ¹²⁾	$43 + 10 \log (X)$, or 60 dBc, whichever is less stringent, where $X = PEP$ for SSB modulation, and $X = P$ for other modulation
Low-power device radio equipment ¹³⁾	$56 + 10 \log (P)$, or 40 dBc, whichever is less stringent
Emergency position-indicating radio beacon Emergency locator transmitter Personal location beacon Search and rescue transponder Ship emergency, lifeboat and survival craft transmitters Land, aeronautical or maritime transmitters when used in emergency	No limit

P: mean power in watts supplied to the antenna transmission line, in accordance with No. **S1.158**. When burst transmission is used, the mean power *P* and the mean power of any spurious emissions are measured using power averaging over the burst duration.

PEP: peak envelope power in watts supplied to the antenna transmission line, in accordance with No. **S1.157**.

dBc: decibels relative to the unmodulated carrier power of the emission. In the cases which do not have a carrier, for example in some digital modulation schemes where the carrier is not accessible for measurement, the reference level equivalent to dBc is decibels relative to the mean power *P*.

Notes to Table II

¹⁰⁾ Spurious emission limits for all space services are stated in a 4 kHz reference bandwidth.

¹¹⁾ For analogue television transmissions, the mean power level is defined with a specified video signal modulation. This video signal has to be chosen in such a way that the maximum mean power level (e.g. at the video signal blanking level for negatively modulated television systems) is supplied to the antenna transmission line.

¹²⁾ All classes of emission using SSB are included in the category "SSB".

¹³⁾ Low-power radio devices having a maximum output power of less than 100 mW and intended for short-range communication or control purposes; such equipment is in general exempt from individual licensing.

USA/1.2/6
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¹⁴⁾ ~~These values are "design objectives". This note will not be applicable after the 1999 World Radiocommunication Conference.~~ Radiodetermination (Radar) system spurious emission dB attenuation shall be determined for radiated emission levels, not at the antenna transmission line. The measurement methods for determining the radiated spurious emission levels from the radar systems should be guided by Recommendation ITU-R M.1177.

¹⁵⁾ In some cases of digital modulation (including digital broadcasting), broadband systems, pulsed modulation and narrow-band high-power transmitters for all categories of services, there may be difficulties in meeting limits close to $\pm 250\%$ of the necessary bandwidth.

USA/1.2/7
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¹⁶⁾ Amateur earth stations operating below 30 MHz are in the service category 'Amateur services operating below 30 MHz (including with SSB).'

USA/1.2/8
ADD

¹⁷⁾ Space stations, intended to operate in deep space (defined in **S1.177**) are except from spurious emission limits.

Reasons: Recommendation No. **66 (Rev. WRC-97)** directs the ITU-R to submit a report to the next WRC with a view to finalizing the space services spurious emissions limits in Appendix **S3** of the Radio Regulations. The United States proposes to confirm the values in Table II and "clean up" the table by removing the "design objectives" designation from the space services spurious emissions limits. Furthermore, by clarifying the exemption of radar systems from the Section I limits, the United States proposes to correct an oversight in Appendix **S3** regarding limits for the radiodetermination service that may lead incorrectly to the application of the Section I limits to radars. Also, the United States proposes to clarify the application of the e.i.r.p. measurement method to radars particularly, but also to other systems where antenna line measurements may not be appropriate.

Proposals for Agenda Item 1.3

to consider the results of ITU-R studies in respect of Appendix **S7/28** on the method for the determination of the coordination area around an earth station in frequency bands shared among space services and terrestrial radiocommunication services, and to take the appropriate decision to revise this Appendix

Revision of Appendix S7 (23July99)

Background Information: Appendix **S7** provides the methods for determining the coordination area around earth stations. These methods have not been updated in the Radio Regulations since 1979. Since that time system characteristics have changed, new bands have been allocated to satellite services, and propagation tools have been improved.

ITU-R Recommendation **SM. XX** consolidates the text of ITU-R Recommendations **847** through **849**, uses updated system characteristics, extends the frequency range, and separates the propagation aspects from other probability aspects. Therefore, it serves as a useful basis for updating Appendix **S7**.

Proposal¹:

Recognizing that the frequency bands covered by the methods for determining coordination areas, the system technical characteristics, and the potential operating scenarios will change with the decisions at each WRC, the United States proposes incorporating ITU-R Recommendation **SM. XX** into the Radio Regulations by reference. Even if Appendix **S7** is updated based on ITU-R Recommendation **SM. XX**, it will probably be out-of-date at the close of WRC-2000 based on decisions made at the conference. It will remain so for years to come unless the recommendation is referenced to facilitate future updates. If the incorporation-by-reference method is not used, future updates will require a specific agenda item to be agreed. Given that it has required twenty years to update the current appendix and noting the rapid evolution of satellite and terrestrial radio communications, another long delay in updating the text would not be acceptable.

This proposed modification to Appendix **S7** involves the suppression of the entire text of the Appendix and its replacement with the "incorporation-by-reference" text as shown below. Furthermore, it includes updated references in Appendix **S5** TABLE **S5-1**, and Appendix **S5** Annex 1 TABLES 2, 3 and 4.

¹ Only the portion of the tables being modified are shown in this proposal.

~~APPENDIX S7~~

USA/1.3/9
MOD

~~Method for the Determination of the Coordination Area Around an
Earth Station in Frequency Bands Between 1 GHz and 40 GHz Shared
Between Space and Terrestrial Radiocommunication Services~~

Reasons: All text in the current Appendix **S7** should be suppressed.

APPENDIX S7

USA/1.3/10
ADD

**Method for the Determination of the Coordination Area Around an
Earth Station in Frequency Bands Between .1 GHz and 105 GHz Shared
Between Space and Terrestrial Radiocommunication Services**

The method for determining the coordination area around an earth station between the frequency bands between .1 GHz and 105 GHz shared between space and terrestrial radiocommunications services is given in Annexes 1 and 2 of ITU-R Recommendation SM. XX.

Reason: To update the method for determining coordination areas and to provide a responsive mechanism for future updates.

APPENDIX S5

USA/1.3/11
MOD

**Identification of administrations with which coordination is to be effected or
agreement sought under the provisions of Article S9**

TABLE S5-1

Technical conditions for coordination
(see Article S9)

Reference of Article S9	Case	Frequency bands (and Region) of the service for which coordination is sought	Threshold/condition	Calculation method	Remarks
No. S9.17 GSO, Non-GSO/terrestrial	A specific earth station or a typical mobile earth station in frequency bands above 1 GHz allocated with equal rights to space and terrestrial services in respect of terrestrial stations, where the coordination area of the earth station includes the territory of another country, with the exception of the coordination under No. S9.15	Any frequency band allocated to a space service, except those mentioned in Plans in Appendix S30A	The coordination area of the earth station covers the territory of another earth administration	Recommendation ITU-R SM. XX-Appendix S7 (for earth stations in the radiodetermination-satellite service (RDSS) in the bands: 1610-1626.5 MHz, 2483.5-2500 MHz and 2500-2516.5 MHz, see Remarks column) 1)The coordination area of aircraft earth stations is determined by increasing the service area by 1000 km with respect to the aeronautical mobile service (terrestrial) or 500 km with respect to terrestrial services other than the aeronautical mobile service	Note – For RDSS earth stations, a uniform coordination distance of 400 km corresponding to an airborne earth station shall be used. In cases where the earth stations are all ground-based, a coordination distance of 100 km shall be used

No. S9.17A GSO, non-GSO/ GSO, non-GSO	A specific earth station in respect of other earth stations operating in the opposite direction of transmission in frequency bands allocated with equal rights to space radiocommunication services in both directions of transmission, where the coordination area of the earth station includes the territory of another country or the earth station is located within the coordination area of a coordinated earth station, with the exception of the frequency bands subject to the Plans in Appendix S30A	Any frequency band allocated to a space service	The coordination area of the earth station covers the territory of another administration or the earth station is located within the coordination area of an earth station	i) For bands in Table S5-2, see § 2 of Annex 1 of this Appendix ii) See Recommendations ITU-R IS.847 , ITU-R IS.848 and ITU-R IS.849	
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Reasons: Update references to recommendations dealing with determination of coordination areas.

Appendix S5

Annex 1

USA/1.3/12
MOD

TABLE 2

Earth stations operating at frequencies in the 1-3 GHz range

Frequency sharing situation		Coordination distance (in sharing situations involving services allocated with equal rights)(km)
Frequency band and earth station for which coordination area is determined	Other service or station (station in terrestrial service or earth station)	
Ground-based mobile (NOTE 1) (GSO network)	Ground-based stations in terrestrial services	Determined using Recommendation ITU-R ISSM.XX-847 with the parameters specified therein for terrestrial stations and all applicable equations and figures
Ground-based mobile (NOTE 1) (non-GSO network)	Ground-based stations in terrestrial services	Determined using The methodology of Recommendation ITU-R ISSM.XX-849 is applied in conjunction with Recommendation ITU-R IS847 (see above)

NOTE 1 – Recommendation ITU-R ~~ISSM.XX-847~~ supplies the necessary terrestrial station parameters for the bands 1 492-1 530 MHz, 1 555-1 559 MHz, 1 610-1 645.5 MHz, 1 646.5-1 660 MHz, 1 675-1 710 MHz, 1 980-2 025 MHz, 2 160-2 200 MHz, 2 483.5-2 520 MHz, and 2 655-2 690 MHz.

Reason: Update references to recommendations dealing with determination of coordination areas.

USA/1.3/13
MOD

TABLE 3

Non-GSO MSS feeder-link earth stations

Frequency sharing situation		Coordination distance (in sharing situations involving services allocated with equal rights)
Frequency band and earth station for which coordination area is determined	Other service or station (station in terrestrial service or earth station)	
19.3-19.7 GHz and 29.1-29.5 GHz; earth station operating co-directionally with other earth stations	Ground-based stations in terrestrial services	Determined using Recommendations ITU-R IS.847 IS.849 and ITU-R SM.849 with the parameters specified therein for terrestrial stations and all applicable equations and figures.

Reason: Update references to recommendations dealing with determination of coordination areas.

TABLE 4

Non-GSO FSS earth stations

Frequency sharing situation		Coordination distance (in sharing situations involving services allocated with equal rights)
Frequency band and earth station for which coordination area is determined	Other service or station (station in terrestrial service or earth station)	
18.9-19.3 GHz and 28.7-29.1 GHz; earth station operating co-directionally with other earth stations	Ground-based stations in terrestrial services	Determined using Recommendations ITU-R IS.847 IS.849 and ITU-R IS.849 with the parameters specified therein for terrestrial stations and all applicable equations and figures.

Reason: Update references to recommendations dealing with determination of coordination areas.

USA/1.3/14
MOD

Proposals for Agenda Item 1.4

to consider issues concerning allocations and regulatory aspects related to Resolutions **126** (WRC-97), **128** (WRC-97), **129** (WRC-97), **133** (WRC-97), **134** (WRC-97) and **726** (WRC-97)

Proposal to modify Table S21-4 of ART S21 and the suppression of Res 129 and 133 (July 99)

Background Information: *Requests ITU-R* 1 of Resolution **133** (WRC-97) requested the ITU-R to determine whether the power-flux density limits included in Article **S21** of the Radio Regulations adequately protect terrestrial services from FSS networks in the band 37.0-40.0 GHz. Resolution **129** (WRC-97) requested the ITU-R to undertake studies of appropriate criteria and methodologies for sharing, including power flux-density limits, between the fixed-satellite service and the other services with allocations in the band 40.5-42.5 GHz.

The results of studies conducted in the ITU-R of known and proposed non-GSO FSS systems, and of known and proposed point to point (P-P) and point-to-multi-point (P-MP) FS systems, indicate that maximum allowable values of power flux-density of -120/-105 dB(W/m²-MHz) at the surface of the earth would be adequate to protect systems operating in the fixed service from non-GSO FSS networks in the frequency band 37.5 - 40.5 GHz. These results are applicable for protection of the Mobile Service in this band as well.

The results of studies conducted in the ITU-R of known and proposed non-GSO FSS systems, and of known and proposed P-P and P-MP FS systems, indicate that maximum allowable values of power flux-density of -115 / -105 dB(W/m²-MHz) at the surface of the Earth would be adequate to protect systems operating in the fixed service from non-GSO FSS networks in the frequency band 40.5 - 42.5 GHz. These results are applicable for the terrestrial Broadcasting Service in this band as well.

In both cases, the studies were deemed valid for non-GSO FSS systems comprised of 99 or fewer satellites, and that independent verification would have to be performed if these levels were to be applied to any non-GSO FSS system with more than 99 satellites in its constellation. The results of the studies are reflected in Draft New Recommendation [4-9S/AH1], Maximum Allowable Values of Power Flux-Density at the Surface of the Earth Produced by Non-Geostationary Satellites in the Fixed-Satellite Service Operating in the 37.5 - 40.5 GHz and 40.5 - 42.5 GHz Bands to Protect the Fixed Service.

The results of studies conducted in the ITU-R show that, for a range of non-GSO and GSO fixed-satellite systems, and for a point-to-point and point-to-multipoint fixed service system operating with elevation angles that range from 0° - 40°, the pfd levels of -115/-105 dB(W/m² per MHz) are adequate to protect the fixed service in the band 37.5 - 42.5 GHz from interference caused by GSO fixed-satellite service systems.

On the basis of these conclusions, the United States makes the following proposals for modifications and additions to Table **S21-4** of Article **S21** are made, and to suppress Resolutions **133** and **129** (both WRC-97). The United States bases its proposal to suppress Resolution **133** on the completion of the power flux-density studies referenced in Resolves 1 of that Resolution. These power flux density studies were performed relative to the fixed service and are assumed to adequately protect the co-primary Mobile Service as well. To the extent that there may be aspects of studies that encompass matters in Resolves 2 of Resolution **133** still ongoing in the ITU-R, particularly on issues of coordination methodology, the United States may make additional proposals (e.g., for a new WRC-2000

Resolution) to enable the completion of any such studies that have not been successfully completed prior to WRC-2000.

Proposal

USA/1.4/15 MOD

TABLE S21-4 (*end*)

Frequency band	Service	Limit in dB(W/m ²) for angle of arrival (*) above the horizontal plane			Reference bandwidth
		0° - 5°	5° - 25°	25° - 90°	
31.0-31.3 GHz 34.7-35.2 GHz (space-to-Earth transmissions referred to in No. S5.550 on the territories of countries listed in No. S5.549) 37.0-40.5 GHz	Fixed-satellite (<u>geostationary-satellite orbit</u>) Mobile-satellite Space research	-115 ¹⁰	-115 + 0.5 (*-5) ¹⁰	-105 ¹⁰	1 MHz
<u>37.5-40.5 GHz</u>	<u>Fixed-satellite</u> (<u>non-geostationary-satellite orbit</u>)	<u>-120¹⁰</u>	<u>-120 + 0.75 (*-5)¹⁰</u>	<u>-105¹⁰</u>	<u>1 MHz</u>
<u>40.5-42.5 GHz</u>	<u>Fixed-Satellite</u>	<u>-115¹⁰</u>	<u>-115 + 0.5 (*-5)¹⁰</u>	<u>-105¹⁰</u>	<u>1 MHz</u>

USA/1.4/16 MOD

¹⁰ **S21.16.4** The values given in this table shall not apply to emissions of space stations on non-geostationary satellites in networks operating with 100 or more satellites.

Reasons: The PFD-review objectives of Resolutions **133 (WRC-97)** and **129 (WRC-97)** have been met. The values stated above for non-geostationary satellite orbit FSS systems in the bands 37.5 - 40.5 GHz and 40.5 - 42.5 GHz respectively are included in a draft new recommendation approved by the ITU-R. See Draft New Recommendation [4-9S/AH1], Maximum Allowable Values of Power Flux-Density at the Surface of the Earth Produced by Non-Geostationary Satellites in the Fixed-Satellite Service Operating in the 37.5 - 40.5 GHz and 40.5 - 42.5 GHz Bands to Protect the Fixed Service. The studies under Resolution **129** were done with respect to the Fixed Service but are assumed to be adequate for protecting the co-primary terrestrial Broadcasting Service as well. In addition, studies have demonstrated the suitability for application to geostationary satellite-orbit FSS systems of the current pfd limits in the 37.5 - 40 GHz band and the application of the same limits to the fixed-satellite service in the 40.5 - 42.5 GHz band

~~Resolution 133 (WRC-97)~~

USA/1.4/17
SUP

~~Sharing Between the Fixed Service and Other Services in the Band 37-40 GHz~~

Reasons: Consequential

~~Resolution 129 (WRC-97)~~

USA/1.4/18
SUP

**~~Criteria and Methodologies for Sharing Between the Fixed-Satellite Service
and Other Services with Allocations in the Band 40.5-42.5 GHz~~**

Reasons: Consequential

Proposal for the suppression of Fixed Services in the 31.4-33.4 GHz band (4August99)

Background Information: WRC-97 added a primary allocation to the fixed service in the frequency band 31.8 - 33.4 GHz. Footnote **S5.547A** sets forth that the use of this band by the fixed service shall be in accordance with Resolution **126 (WRC-97)**, and Footnote **S5.547** makes this band (among others) available for high-density applications in the fixed service per Resolution **726 (WRC-97)**. Taken together, Resolutions **126 (WRC-97)** and **726 (WRC-97)** *resolve* that;

- the date of application of the fixed service and high-density allocations therein is 1 January 2001, and,
- that WRC-2000 should review this allocation, including the date of application, taking full account of the future requirements and development of the other services to which the band is allocated and available ITU-R studies.

The radionavigation service is one of the incumbent primary services in the frequency band 31.8 - 33.4 GHz. ITU-R WP 9D, per the *requests* of Resolution **126 (WRC-97)**, has been studying the criteria necessary for sharing between stations in the fixed service and stations in the other services to which the frequency band 31.8 - 33.4 GHz is allocated. Study results indicate that there is a significant potential for interference from stations in the radionavigation service into stations of the fixed service. There is also a potential for degradation in the performance of the radionavigation service due to the emissions of the fixed service.

Airborne radars operate on a worldwide basis in the frequency band 31.8 - 33.4 GHz. Proponents of the use of this frequency band for the fixed service are proposing that the radionavigation service restricts its operations with respect to radar antenna pointing angles and operational altitudes. They further propose to assign “priority channels” (a communications term not generally used with respect to radars) such that certain frequencies within the band would be designated for use by the radars. This latter proposal is actually a form of band segmentation (at least on a geographic basis) and is in conflict with the opinions of both the fixed service and radionavigation service that band segmentation is not recommended.

The criteria being considered for sharing, as described above, are onerous and contrary to the operational requirements of the radionavigation service. Further, no allowance is being made for the future requirements and development of the radionavigation service per *resolves* 2 of Resolution **126 (WRC-97)**. For these reasons, the following proposals are made to remove the provisional allocation of the band 31.8 - 33.4 GHz to the fixed service and high-density applications therein.

Proposals:

Section IV – Table of Frequency Allocations

31.8 - 33.4 GHz

Allocation to services	
Region 1	Region 2
Region 3	
USA/1.4/19 MOD	31.8-32 FIXED S5.547A RADIONAVIGATION SPACE RESEARCH (deep space) (space-to-Earth) MOD S5.547 S5.547B S5.548
USA/1.4/20 MOD	32-32.3 FIXED S5.547A INTER-SATELLITE RADIONAVIGATION SPACE RESEARCH (deep space) (space-to-Earth) MOD S5.547 S5.547C S5.548
USA/1.4/ 21 MOD	32.3-33 FIXED S5.547A INTER-SATELLITE RADIONAVIGATION MOD S5.547 S5.547D S5.548
USA/1.4/ 22 MOD	33-33.4 FIXED S5.547A RADIONAVIGATION MOD S5.547 S5.547E
USA/1.4/ 23 MOD	S5.547 The bands 31.8 – 33.4 GHz , 51.4 - 52.6 GHz, 55.78 - 59 GHz, and 64 - 66 GHz are available for high-density applications in the fixed service (see MOD Resolution 726 (WRC-97)).
USA/1.4/ 24 SUP	S5.547A
USA/1.4/ 25 SUP	S5.547B
USA/1.4/ 26 SUP	S5.547C
USA/1.4/ 27 SUP	S5.547D
USA/1.4/ 28 SUP	S5.547E Reasons: ITU-R studies have shown that unacceptable operational limitations would be necessary upon the existing radionavigation service in the band 31.4 – 33.4 GHz, in order to accommodate fixed service use of this band. Such operational limitations (such as limitations upon altitude of use and antenna pointing angles) are contrary to the inherent requirements of the radionavigation

service. Further, postulated assignment of “priority channels” for use by the radionavigation service will reduce the bandwidth available for frequency agile and frequency hopping systems, which is required to meet system performance requirements in adverse environmental conditions and increase intra-system interference problems within the radionavigation service. Finally, sharing with the fixed service will severely impact future requirements and restrict developments by the radionavigation service.

USA/1.4/ 29
SUP

~~RESOLUTION 126 (WRC-97)~~

~~USE OF THE FREQUENCY BAND 31.8 – 33.4 GHz FOR HIGH DENSITY
SYSTEMS IN THE FIXED SERVICE~~

Reason: Consequential to changes made to the allocation table.

RESOLUTION 726 (WRC-97)

**FREQUENCY BANDS ABOVE 30 GHz AVAILABLE FOR HIGH-
DENSITY APPLICATIONS IN THE FIXED SERVICE**

Resolves

USA/1.4/ 30
MOD

that administrations should take into account that the bands ~~31.8 – 33.4 GHz~~, 51.4 - 52.6 GHz, 55.78 – 59 GHz and 64 – 66 GHz are available for high-density applications in the fixed service, when considering allocations or other regulatory provisions in relation to these bands,

~~*The date of provisional application of this allocation shall be in conformity with Resolution 126.~~

Reason: Consequential to the changes made to the allocation table.

**Proposal for the addition of the Fixed Satellite Service in the 40.5 - 42.5 GHz band in Region 1
(2August99)**

Background Information: Resolution **134 (WRC-97)** makes the date of the provisional application of the allocation to the FSS in Regions 1 and 3 in the band 40.5 - 42.5 GHz 1 January 2001, and calls for review of the allocation and provisional application date. On the basis of studies conducted in the ITU-R, it is appropriate to advance the date of the application of the FSS allocation in Regions 1 and 3 to 2 June 2000 (upon the conclusion of WRC-2000), and to extend the allocation to all of Region 1 (thereby enabling the removal of RR **S5.551C**, RR **S5.551D** and RR **S5.551E**, and the suppression of Resolution **134 (WRC-97)**). In advancing this proposal, it must be recognized that fixed-satellite service systems in the band 41.5 - 42.5 GHz may not be implemented until technical and operational measures have been identified and agreed within ITU-R to protect the radio astronomy service in the band 42.5 - 43.5 GHz from harmful interference.

On the basis of these conclusions, the following proposals are made:

Article S5

**GHz
40.5-42.5**

USA/1.4/ 31
MOD

Allocation to Services		
Region 1	Region 2	Region 3
40.5-42.5 FIXED <u>FIXED-SATELLITE</u> (space-to-Earth) BROADCASTING BROADCASTING-SATELLITE Mobile S5.551B S5.551D	40.5-42.5 FIXED FIXED-SATELLITE (space-to-Earth) S5.551B S5.551E BROADCASTING BROADCASTING-SATELLITE Mobile S5.551C S5.551F	40.5-42.5 FIXED FIXED-SATELLITE (space-to-Earth) S5.551B S5.551E BROADCASTING BROADCASTING-SATELLITE Mobile S5.551C S5.551F

Reasons: With the exception of sharing issues and studies identified in Resolution 128, studies in ITU-R confirm the feasibility of the fixed-satellite service allocation in the bands 40.5 - 42.5 GHz, and the need for harmonized global allocations. With the elevation of the allocation to full primary status in all 3 regions, the footnote allocation for countries in Region 1 can be removed. Those countries that are listed or that have territories listed in RR **S5.551C** should give consideration to whether the alternative allocation in certain countries and territories in Regions 2 and 3 can be suppressed. Acceleration of the effective date allows for removal of the reference to Resolution **134 (WRC-97)**. In advancing this proposal, it must be recognized that fixed-satellite service systems in the band 41.5 - 42.5 GHz may not be implemented until technical and operational measures have been identified and agreed within ITU-R to protect the radio astronomy service in the band 42.5 - 43.5 GHz from harmful interference.

USA/1.4/ 32
SUP

~~S5.551D~~

Reasons: With the elevation of the allocation to full primary status in all 3 regions, the footnote allocation for countries in Region 1 can be removed.

USA/1.4/ 33
SUP

~~S5.551E~~

Reasons: With the elevation of the allocation to full primary status in all 3 regions, the footnote allocation for countries in Region 1 can be removed.

USA/1.4/ 34
SUP

Suppression of Resolution 134 (WRC-97)

~~**Resolution 134 (WRC-97)**
Use of the frequency band 40.5 - 42.5 GHz
by the fixed-satellite service~~

Reasons: Consequential to change of allocation.

USA/1.4/ 35
MOD

RESOLUTION 128 (MOD WRC-9700)

Allocation to the fixed-satellite service (space-to-Earth) in the 41.5 - 42.5 GHz band and protection of the radio astronomy service in the 42.5 - 43.5 GHz band

The World Radiocommunication Conference (~~Geneva, 1997~~Istanbul, 2000),

considering

a) that ~~this Conference~~WRC-97 added a primary allocation to the fixed-satellite service (space-to-Earth) in the band 41.5 - 42.5 GHz in Regions 2 and 3 and in certain countries in Region 1, that this Conference expanded this allocation to include all of Region 1, and that this band is adjacent to the band 42.5 - 43.5 GHz which is allocated, *inter alia*, to the radio astronomy service for both continuum and spectral line observations;

b) that unwanted emissions from space stations in the fixed-satellite service (space-to-Earth) in the band 41.5 - 42.5 GHz may result in harmful interference to the radio astronomy service in the band 42.5 - 43.5 GHz;

c) that various technical means may be used to reduce these unwanted emissions from space stations in the fixed-satellite service;

d) that a limited number of radio astronomy stations worldwide require protection, and that there may be means to limit the susceptibility of radio astronomy receivers to interference,

taking into account

the relevant provisions of the Radio Regulations,

resolves

that administrations shall not implement fixed-satellite systems in the band 41.5-42.5 GHz until technical and operational measures have been identified and agreed within ITU-R to protect the radio astronomy service from harmful interference in the band 42.5-43.5 GHz,

invites ITU-R

1 to study, as a matter of urgency, the harmful interference that space stations in the fixed-satellite service (space-to-Earth) operating in the band 41.5-42.5 GHz may cause to stations in the radio astronomy service operating in the band 42.5-43.5 GHz;

2 to identify technical and operational measures that may be taken to protect stations in the radio astronomy service operating in the band 42.5 - 43.5 GHz, including geographical separation and out-of-band emission limits to be applied to space stations operating in the fixed-satellite service in the band 41.5 - 42.5 GHz, as well as measures that may be implemented to reduce the susceptibility of stations in the radio astronomy service to harmful interference;

3 to report on the results of these studies to the Conference Preparatory Meeting for **WRC-~~99~~02/03**,

urges administrations

to participate actively in the aforementioned studies by submitting contributions to ITU-R,

requests

WRC-~~99~~02/03 to take appropriate action based on those studies.

Reason: Consequential to the change of the allocation to primary and requested ITU-R studies are not completed.

Proposal concerning high density applications in the fixed service (5August99)

Background Information: WRC-97, in its realignment of the 50.2 - 71 GHz spectral region, placed a primary allocation to the fixed service in the frequency band 55.78 - 59 GHz. Footnote **S5.547** and Resolution **726 (WRC-97)** indicate that this band (among others) is available for high-density applications in the fixed service.

With respect to 55.78 - 59 GHz, Resolution **726 (WRC-97)** resolves that administrations should take into account that this band is available for high density application in the fixed service, when considering allocations or other regulatory provisions in relation to this band and requests ITU-R,

- ! to undertake studies leading to the identification of system characteristics of high-density systems in the fixed service in 55.78 - 59 GHz, and
- ! to undertake, as a matter of urgency, studies of technical and operational criteria and of methods to facilitate sharing between high-density systems in the fixed service and other services in 55.78 - 59 GHz.

Joint Rapporteur Group (JRG) 7D-9D has not resolved issues related to sharing between high density fixed systems and the Earth Exploration-Satellite (passive) Service in the 55.78 - 56.26 GHz band. Therefore, the band needs to be removed from *consider j* of Resolution **726 (WRC-97)**. Furthermore, the resolution needs to be modified to indicate that *requests 1* and *2* continue to apply only to the 55.78 - 56.26 GHz band. This would continue the studies in that band.

Proposal:

**Section IV – Table of Frequency Allocations
55.78 - 56.9 GHz**

Allocation to services		
Region 1	Region 2	Region 3
USA/1.4/ 36 MOD	55.78-56.269 EARTH EXPLORATION-SATELLITE (passive) FIXED INTER-SATELLITE S5.556A MOBILE S5.558 SPACE RESEARCH (passive) S5.547 S5.557	
	55.78 56.26-56.9 EARTH EXPLORATION-SATELLITE (passive) FIXED S5.547 INTER-SATELLITE S5.556A MOBILE S5.558 SPACE RESEARCH (passive) S5.547 S5.557	

**USA/1.4/ 38
MOD**

S5.547 The bands 31.8 - 33.4 GHz, 51.4 - 52.6 GHz, ~~55.78~~56.26 - 59 GHz and 64 - 66 GHz are available for high-density applications in the fixed service (see Resolution **726 (WRC-97)**).

Reasons: The footnote **S5.547** should be associated with the fixed service. Also, ITU-R studies have shown that, without limitations on the power of high-density applications in the fixed service in the band 55.78 - 56.26 GHz, unacceptable interference may occur to passive sensors onboard Earth Exploration-Satellites. Further study is required to determine whether limits on the fixed service are needed to protect EES passive sensors.

RESOLUTION 726 (WRC-972000)

Frequency bands above 30 GHz available for high-density applications in the fixed service

USA/1.4/ 39
MOD

The World Radiocommunication Conference (~~Geneva, 1997~~Istanbul, 2000),

considering

- a)* that there is a dramatically increasing demand for high-density applications in the fixed service resulting from the deployment of new mobile networks and from the rapid worldwide deregulation in the provision of local broadband services, including multimedia;
- b)* that the frequency range from 30 GHz to about 50 GHz is the range preferred to satisfy initial requirements, as indicated in *considering a)*, while the bands above about 50 GHz are preferred for similar applications but which take technical advantage of high atmospheric absorption;
- c)* that the lower part of the spectrum above 30 GHz has advantages for the fixed service in areas where longer path lengths are necessary;
- d)* that the 38 GHz band is already heavily used by many administrations for high-density applications in the fixed service;
- e)* that the needs of other services to which the relevant frequency bands are already allocated must be taken into account;
- f)* that the band 37 - 37.5 GHz is being planned for use by the space research service (space-to-Earth) to provide moon-to-Earth and planetary communication links;
- g)* that the band 37 - 38 GHz is being planned for use by the space research service to provide space based very long baseline interferometry;
- h)* that the deployment of high-density applications in the fixed service in some bands potentially presents sharing difficulties with other primary services allocated to the same band, e.g. the fixed-satellite service;
- i)* that operations in the space services, such as in the fixed-satellite service, in those bands used by high-density applications in the fixed service may lead to sharing difficulties;
- j)* that there is a need for global harmonization of new and existing allocations of radio frequency bands to facilitate coordination between administrations and encourage development of competitive products, through economies of scale, and the worldwide introduction of new telecommunication services, including the provision of reliable global information infrastructure access at an affordable cost,

resolves

**USA/1.4/ 40
MOD**

that administrations should take into account that the bands 31.8 - 33.4 GHz*, 51.4 - 52.6 GHz, ~~55.78~~56.26 - 59 GHz and 64 - 66 GHz are available for high-density applications in the fixed service, when considering allocations or other regulatory provisions in relation to these bands,

requests ITU-R

**USA/1.4/ 41
MOD**

1 to undertake studies leading to the identification of system characteristics of high-density systems in the fixed service in the 55.78 - 56.26 bands ~~listed in the~~ resolves;

**USA/1.4/ 42
MOD**

2 to undertake, as a matter of urgency, studies of technical and operational criteria and of methods to facilitate sharing between high-density systems in the fixed service and other services in the 55.78 - 56.26 bands ~~listed in the~~ resolves,

urges administrations

to participate actively in the aforementioned studies by submitting contributions to ITU-R.

* The date of provisional application of this allocation shall be in conformity with Resolution **126 (WRC-97)**.

Proposals for Agenda Item 1.5

to consider regulatory provisions and possible additional frequency allocations for services using high altitude platform stations, taking into account the results of ITU-R studies conducted in response to Resolution **122 (WRC-97)**;

Proposal to modify Res 122, High Altitude Platform Stations in the fixed service (3September99)

Background Information: Resolution **122 (WRC-97)**, “Use of the bands 47.2 – 47.5 GHz and 47.9 – 48.2 GHz by high altitude platform stations in the fixed service and by other services”, instructs the Director of the Radiocommunication Bureau, that from 22 November 1997, to accept notices in the 47.2 - 47.5 and 49.2 - 48.2 GHz only for high altitude platform stations in the fixed service and for feeder links for the broadcasting-satellite services pending review of sharing studies between co-primary services in the band. On the basis of studies conducted in the ITU-R, it is appropriate to modify Resolution **122 (WRC-97)** to take account of draft new Recommendation [4-9S/AAX] that establishes the performance parameters for certain FSS antennas that can share with the HAPS system and to take account of the need for continued studies.

Proposals:

USA/1.5/ 43
MOD

RESOLUTION 122 (WRC-97)

Use of the bands 47.2 - 47.5 GHz and 47.9 - 48.2 GHz by high altitude platform stations in the fixed service and by other services

The World Radiocommunication Conference (~~Geneva, 1997~~Istanbul, 2000),

considering

- a) that the band 47.2 - 50.2 GHz is allocated to the fixed, mobile and fixed-satellite services on a co-primary basis;
- b) that ~~this Conference has~~WRC-97 made provision for operation of high altitude platform stations, also known as stratospheric repeaters, within the fixed service in the bands 47.2 - 47.5 GHz and 47.9 - 48.2 GHz;
- c) that ITU has among its purposes “to promote the extension of the benefit of the new telecommunication technologies to all the world’s inhabitants” (No. 6 of the Constitution of the ITU (Geneva, 1992));
- d) that systems based on new technologies using high altitude platforms in the bands 47.2 - 47.5 and 47.9 - 48.2 GHz will be able to provide high-capacity, competitive services to urban and rural areas;
- e) that high altitude platform systems are in an advanced stage of development and some countries have notified such systems to ITU;
- f) that **WRC-97** adopted a new definition of high altitude platform stations in Article S1, modified No. S11.24 and added No. S11.26 in the Radio Regulations

providing for notices relating to assignments for high altitude platform stations in the bands 47.2 - 47.5 GHz and 47.9 - 48.2 GHz and that the Radio Regulations Board issued a provisional rule of procedure concerning notification periods in No. S11.24/1228 in February 1997;

~~g) that in spite of the urgency attached to the development of such systems, technical, sharing and regulatory issues should be studied in order to achieve the most efficient use of the spectrum available for these systems~~ the ITU-R has confirmed that in certain cases sharing is feasible between high altitude platform stations and the FSS;

h) that technical studies are still required in order to ascertain the extent to which sharing of the bands 47.2 - 47.5 GHz and 47.9 - 48.2 GHz is feasible between systems using high altitude platforms in the fixed service and systems in the fixed, fixed-satellite (other than the specific deployment FSS scenario referenced draft new Recommendation [4-9S/AAX] in and mobile services, and to ascertain the requirements to protect radio astronomy services in adjacent bands from spurious emissions;

i) that the radio astronomy service has primary allocations in the bands 42.5 - 43.5 GHz and 48.94 - 49.04 GHz;

j) that ITU-R studies are already under way on the preferred characteristics of systems using high altitude platforms and the feasibility of sharing between these systems and systems of other services and between these systems and other systems in the fixed service (Questions ITU-R 212/9, ITU-R 218/9 and ITU-R 251/4) and that although Draft New Recommendations [4-9S/AAX] and [9B/HAPS2] have been developed, further studies are required to fully assess the implications of these scenarios and to consider the effect of mitigation techniques on increasing shared use of these bands by HAPS and other systems;

k) that No. **S5.552** urges administrations to reserve fixed-satellite service use of the band 47.2 - 49.2 GHz for feeder links for the broadcasting-satellite service, and that preliminary ITU-R studies indicate that high altitude platform stations in the fixed service may share with broadcasting-satellite feeder links;

l) that the development of services using high altitude platform stations in these bands requires major investment and that manufacturers and operators should be given the confidence to make the necessary investment in these applications,

resolves

1 to urge administrations to facilitate coordination between high altitude platform stations in the fixed service operating in the bands 47.2 - 47.5 GHz and 47.9 - 48.2 GHz and other co-primary services in their territory and adjacent territories;

2 that, on a provisional basis, the procedures of Article **S9** shall be used for coordination between satellite systems and high altitude platform systems;

3 to request ITU-R to ~~carry out urgently~~ continue studies on the appropriate technical sharing criteria for the situations referred to in *considering h*), with priority given to the sharing with other systems in the fixed and fixed-satellite services, ~~in particular the determination of the appropriate geographical separation from feeder links in the broadcasting-satellite service;~~

4 that **WRC-9903** should review the results of these studies and consider refinement of the regulatory provisions for that might facilitate a broader application of these high altitude platform technologies,

instructs the Director of the Radiocommunication Bureau

1 that notices concerning high altitude platform stations that were received by the Bureau prior to 22 November 1997, and provisionally recorded in the Master International Frequency Register in accordance with the provisional rule of procedure issued by the Board, shall be maintained;

2 that from 22 November 1997, and pending review of the sharing studies in *considering h*) and review of the notification process by ~~WRC-99~~ **WRC-2003**, the Bureau shall accept notices in the bands 47.2 - 47.5 GHz and 47.9 - 48.2 GHz only for high altitude platform stations in the fixed service and feeder links for the broadcasting-satellite service, shall continue to process notices for fixed-satellite service networks (except for feeder links for the broadcasting-satellite service) for which complete information for advance publication has been received prior to 27 October 1997, and shall inform the notifying administrations accordingly.

Reasons: To further develop possible sharing criteria among high altitude platform stations and other services in the 47.2 - 47.5 GHz and 47.9 - 48.2 GHz band.

Proposal for Agenda Item 1.6.1

review of spectrum and regulatory issues for advanced mobile application in the context of IMT-2000, noting that there is an urgent need to provide more spectrum for the terrestrial component of such applications and that priority should be given to terrestrial mobile spectrum needs, and adjustments to the table of frequency allocations as necessary (27July99)

Proposal for NOC in the 2 700 – 3 100 Band

Background Information: The United States proposes NOC for the bands 2 700 - 2 900 MHz and 2 900 - 3 100 MHz. These two bands are used extensively throughout the world for the meteorological radars and other radionavigation and radiolocation systems. The impact of an allocation for mobile service use by IMT-2000, on these critical radar operations has not been studied by the ITU-R.

The 2700 - 2900 MHz band is used for aeronautical radionavigation radars providing essential safety-of-life related terminal approach guidance for commercial aircraft. The band 2900 - 3100 MHz is used extensively by radars and radar beacons operating in the maritime radionavigation service, including vessel traffic services, harbor - harbor entrance navigation and collision avoidance. Marine radars using this band provide an essential navigation capability in poor weather; for example, providing a factor of ten improvement in radar target detection during a snowstorm to that of shipborne radars operating in the 3cm band. The NEXRAD weather radar system, operating at 2900 - 3100 MHz, also provides weather location and prediction information critical for public safety. Studies made during the implementation of NEXRAD have shown that air traffic control and weather radar cannot operate in the same band and in the same vicinity of marine radars and racons without causing interference.

Working Party 8B, in a liaison statement to Task Group 8/1, expressed serious concerns that TG8/1 was recommending critical radionavigation, radiolocation, meteorological aids and telemetry bands via CPM text to WRC-2000 for possible reallocation to the Mobile Service exclusively without consulting the responsible working party.

The CPM text concludes that, given the technical characteristics of the radionavigation, radiolocation and meteorological radars, (e.i.r.p. in the order of 1 GW in some systems and the trend towards high duty cycles), and the need to operate in accordance with the protection criteria contained in ITU-R recommendations, sharing with IMT-2000 systems is considered to be feasible only when explicitly confirmed by ITU-R sharing studies.

Proposal:

2 700 - 3 100 MHz

Allocation to services		
Region 1	Region 2	Region 3
2 700-2 900	AERONAUTICAL RADIONAVIGATION S5.337 Radiolocation S5.423 S5.424	
2 900-3 100	RADIONAVIGATION S5.426 Radiolocation S5.425 S5.427	

**USA/1.6/ 44
NOC**

**USA/1.6/ 45
NOC**

Reasons: ITU-R studies have not been conducted to support an allocation to the mobile service for use by the IMT-2000.

Proposal for Agenda Item 1.6.2

Identification of a global radio control channel to facilitate multimode terminal operation and worldwide roaming of IMT-2000

Proposal not to identify a global control channel for IMT-2000 (23July99)

Background Information: At the time that the WRC-2000 agenda was established, studies were underway within TG8/1 examining whether global roaming could be accomplished by identifying one or more global radio control channels that could allow radios to be tuned to the appropriate frequency band identifying a "physical" channel was wanted, in favor of using other approaches that may include the development of a "logical" channel structure for this purpose.

Based on discussions to date within TG8/1, it has been determined that facilitation of multimode terminal operation and worldwide roaming of IMT-2000 is possible without a specific physical global radio control channel.

Proposal:

**USA/1.6.2/ 46
NOC**

There is not a need to identify a global radio control channel for IMT-2000 in the Radio Regulations, therefore no action is required by WRC-2000.

Reasons: There is no need for a physical radio control channel in order to facilitate the global roaming of IMT-2000 terminals.

Proposal for Agenda Item 1.7

review of the use of the HF bands by the aeronautical mobile (R) and maritime mobile services with a view to protecting operational, distress and safety communications, taking into account Resolution **346 (WRC-97)**

Proposal for protecting operational, distress and safety communications in HF bands used by the aeronautical mobile (R) and maritime mobile services (1August99)

Background Information: WP8B and the CPM have identified two issues comprising this agenda item;

- 1) HF bands allocated for the distress and safety communications of the maritime and aeronautical mobile (R) services have been subjected to an increase in harmful interference caused by unauthorized use. It is essential for the safety-of-life and property that these distress and safety channels are kept free from unauthorized use and harmful interference.
- 2) Several maritime HF distress and safety frequencies are also used for international routine calling. The routine calling can cause interference to distress and safety communications due to the caller not being aware of ongoing traffic on the ship calling frequency since the ship is tuned to a different receive frequency for coast station calls and replies.

MARITIME ISSUES

The protection of maritime HF distress and safety frequencies, in particular the frequencies 12 290 kHz and 16 420 kHz, is addressed in Resolution **346 (WRC-97)**. A significant source of interference to distress traffic on these frequencies is due to their use as calling frequencies. Resolution **346** calls for administrations to minimize the use of these frequencies for non-safety calling purposes by coast and ship stations.

GMDSS distress and safety frequencies are also used for calling in some of the other maritime HF bands. In each maritime HF band one channel is designated as an international calling channel pair for radiotelephony. In the 4, 6, 12 and 16 MHz bands, the distress and safety frequency is the same as the ships transmitting frequency on the calling channel.

The radio telephony calling channels are used on duplex basis, whilst the distress and safety frequencies are used on simplex. When a ship is calling a coast station, it transmits on the distress frequency. The problem is that at times that the ship has difficulty monitoring whether or not there is ongoing distress traffic, because its receiver is on the corresponding coast station frequency. This problem occurs in the 4, 6, 12 and 16 MHz bands and not in the 8, 18, 22 and 25 MHz bands. The problem is being caused by the transmitting station not adhering to existing regulatory standards which require a station to listen on its transmitting frequency prior to transmitting. Equipment modification may be necessary in order to listen on the ship frequency of a duplex pair prior to transmitting on that frequency.

Once initial contact has been established and working frequencies coordinated, traffic handling is accomplished directly on the coordinated working frequencies.

Compliance with existing Radio Regulations, **S52.224** which requires that a station listens before transmitting would alleviate this problem. Further regulations are not required, rather enforcement of the existing regulation.

WP8B considered the modification of Article **S52** and Appendices **S13** and **S17** to exclude routine calling from the HF distress and safety frequencies as a method to satisfy the agenda item. This method may require modification of existing equipment.

The U.S. proposes no change to divide the existing distress and calling channels in two separate frequencies, one exclusive distress and safety frequency and one international radiotelephony calling frequency. The distress frequencies should remain the same as they are at present where calling is allowed and no modifications to the distress procedures are required. Strict compliance and enforcement of existing Radio Regulations, **S52.224**, which requires that a station listen before it transmits would alleviate this problem.

This proposal contains the minimum modifications required in the Radio Regulations and its appendices in order to improve the situation on the HF radiotelephony distress and safety frequencies.

WP8B further encouraged the use of digital selective calling instead of calling by radiotelephony, while recognizing that all vessels may not be fitted with DSC.

This proposal is also encouraging ships and coast stations to use digital selective calling. If voice calling is required, it should in the first instance be done on the coast station working channel and secondarily on the appropriate calling frequency.

AERONAUTICAL ISSUES

The interference to HF frequencies allocated to the aeronautical mobile (R) service between 2 850 kHz and 22 000 kHz appears to be the result of unauthorized non-aviation use of aeronautical mobile (R) frequencies. In some parts of the world the aeronautical mobile (R) HF frequencies are being used for land mobile, broadcast, fixed point-to-point communications and in maritime applications such as in support of fishing fleets. These unauthorized uses have resulted in frequent cases of harmful interference and have diminished the spectrum available for the aeronautical mobile (R) safety-of-life applications.

Administrations should ensure that stations of services other than the aeronautical mobile (R) service refrain from using frequencies in the bands allocated exclusively to the aeronautical mobile (R) service. Administrations should make every effort to identify and locate the source of any unauthorized emission causing harmful interference. Recognizing the such emissions are capable of endangering human life and property and the safe and regular conduct of aircraft operations, should take necessary measures to prevent stations from operating in contravention of ITU Radio Regulations.

WP8B and the CPM recommend modifications of Article **S15** to ensure that suitable provisions are made for the aeronautical mobile (R) service.

The United States proposes modifications to Article **S15** to include reference to Appendix **S27**. This modification will ensure special consideration is given to avoiding interference on the frequencies used for safety and regularity of flight. Currently, Article **S15** only refers to Article **S31** Appendix **S13**, which is primarily for maritime services.

The United States proposes no changes to Appendix **S27**. Presently, the HF bands allocated to the aeronautical mobile (R) service are nearly saturated by the use of analog voice communications. This spectrum must be maintained for the new digital high frequency data link (HF DL) communications. HF DL communications will provide a capability for the transfer of air traffic control and aeronautical operational control data to and from pilots operating over oceanic airspace, on polar routes, and in airspace over sparsely populated or undeveloped countries where other communications systems are not practical. The International Civil Aviation Organization (ICAO) will have completed Standards and Recommended Practices for HF DL before the end of 1999. Appendix **S27** contains the Allotment Plan for the aeronautical use of HF aeronautical mobile (Route) service. Review of Appendix **S27**, if necessary, should be performed by ICAO and by ITU-R Working Party 8B and consequently considered by a subsequent WRC.

Proposal:

ARTICLE S15

Interferences

Section I – Interference from Radio Stations

**USA/1.7/ 47
MOD**

S15.8 § 4 Special consideration shall be given to avoiding interference on distress and safety frequencies and those related to distress and safety identified in Appendix **S13** and safety and regularity of flight identified in Appendix **S27**,

Reasons: Frequencies for safety and regulatory of flight in the Aeronautical Mobile (R) service are not listed in Appendix **S13**, since this appendix is primarily for maritime services. Inclusion of Appendix **S27** in this provision will ensure special consideration is given to avoiding interference on these frequencies used for safety and regularity of flight.

Section VI – Procedure in a case of harmful interference

**USA/1.7 / 48
MOD**

S15.28 § 20 Recognizing that transmissions on the distress and safety frequencies and frequencies used for the safety and regularity of flight (See Article **S31**, ~~and~~ Appendix **S13** and Appendix **S27**) require absolute international protection, and that the elimination of harmful interference to such transmissions is imperative, administrations undertake to act immediately when their attention is drawn to any such harmful interference.

Reasons: Frequencies for safety and regulatory of flight in the Aeronautical Mobile (R) service are not listed in Article **S31** or Appendix **S13**, since this appendix is primarily for maritime services. Inclusion of Appendix **S27** would

lead to the protection of frequencies used for safety and regularity of flight against interference.

USA/1.7/ 49
MOD

S15.35 § 27 On being informed that a station over which it has jurisdiction is believed to have been the cause of harmful interference, an administration shall, as soon as possible, acknowledge receipt of that information by ~~telegram~~ the quickest means available. Such acknowledgement shall not constitute an acceptance of responsibility.

Reasons: Improvements in technology provide quicker means of communicating information, such email and facsimiles. The quicker a case of interference is reported, the quicker the action can be taken against that interference, and the shorter the duration of the interference.

USA/1.7 / 50
NOC

ARTICLE S52

Special rules relating to the use of frequencies

USA/1.7/ 51
NOC

S52.216

C. Bands Between 4 000 kHz and 27 500 kHz

C1. Mode of Operation of Stations

USA/1.7/ 52
MOD

S52.219 3) Coast stations employing class J3E or J2D emissions in accordance with No. **S52.217** in the bands between 4 000 and 27 500 kHz shall use the minimum power necessary to cover their service area and shall at no time use a peak envelope power in excess of 10 kW per channel. On the radiotelephony calling frequencies 4 417 kHz and 6 516 kHz coast stations shall limit their peak envelope power to the lowest value to maintain reliable communications, not to exceed 5 kW.

Reasons: Due to geographical differences, the higher power of 5 kW is required to provide adequate communications coverage.

USA/1.7/ 53
NOC

S52.220 4) Ship stations employing class J3E or J2D emissions in accordance with No. **S52.217** in the bands between 4 000 kHz and 27 500 kHz shall at no time use a peak envelope power in excess of 1.5 kW per channel.

Reasons: Higher shipboard power increases the potential for interference and out of band emissions.

USA/1.7/ 54
ADD

S52.220A Administrations should encourage the coast stations and ships under their jurisdiction to utilize the digital selective calling techniques for call and reply.

Reasons: Decreases the potential for interference on the distress channels.

USA/1.7/ 55
ADD

S52.220B When calling by radiotelephony is necessary, it should be done (in order of preference):

Reasons: Decreases the potential for interference on the distress channels

USA/1.7/ 56
ADD

S52.220C (1) On the working frequencies assigned to the coast station in question or

Reasons: Decreases the potential for interference on the distress channels

USA/1.7/ 57
ADD

S52.220D (2) when this is not possible, on the international calling frequencies listed under **S52.221**.

Reasons: Decreases the potential for interference on the distress channels

C2. Call and Reply

USA/1.7/ 58
NOC

S52.221 § 97. (1) Ship stations may use the following carrier frequencies for calling in radiotelephony:

4 125 kHz^{3, 4, 5}
6 215 kHz^{4, 5}
8 255 kHz
12 290 kHz⁵
16 420 kHz⁵
18 795 kHz
22 060 kHz
25 097 kHz

Reasons: It is not necessary to convert calling frequencies from duplex to simplex.

USA/1.7/ 59
NOC

³ **S52.221.1** In the United States, the carrier frequency 4 125 kHz is also authorized for common use by coast and ship stations for single-sideband radiotelephony on a simplex basis, provided the peak envelope power of such stations does not exceed 1 kW (see also No. **S5.222.2**).

Reasons: This note supports existing U.S. use of this channel in remote areas of our Search and Rescue areas of responsibility and supports communications in remote areas.

USA/1.7/ 60
NOC

⁴ **S52.221.2** The carrier frequencies 4 125 kHz and 6 215 kHz are also authorized for common use by coast and ship stations for single-sideband radiotelephony on a simplex basis for call and reply purposes, provided that the peak envelope power of such stations does not exceed 1 kW. The use of these

frequencies for working purposes is not permitted (see also Appendix **S13** and No. **S52.221.1**).

Reasons: This note supports existing U.S. use of this channel in remote areas of Search and Rescue responsibility and supports communications in remote areas.

USA/1.7/ 61
NOC

⁵ **S52.221.3** The carrier frequencies 4 125 kHz, 6 215 kHz, 8 291 kHz, 12 290 kHz and 16 420 kHz are also authorized for common use by coast and ship stations for single-sideband radiotelephony on a simplex basis for distress and safety traffic.

Reasons: This note supports existing uses and enhances maritime safety in remote geographical areas.

USA/1.7/ 62
NOC

S52.222 (2) Coast stations may use the following carrier frequencies for calling in radiotelephony⁶:

4 417 kHz⁷
6 516 kHz⁷
8 779 kHz
13 137 kHz
17 302 kHz
19 770 kHz
22 756 kHz
26 172 kHz

Reasons: Conversion to simplex operation is not necessary.

USA/1.7/ 63
SUP

⁶ **S52.222.1** These frequencies may also be used by coast stations with class H2B emission, when using the selective calling system defined in Recommendation ITU-R M.257-3.

Reasons: This system is out of date and no longer in use.

USA/1.7/ 64
MOD

⁷ **S52.222.2** The carrier frequencies 4 417 kHz and 6 516 kHz are also authorized for common use by coast and ship stations for single-sideband radiotelephony on a simplex basis, provided that the peak envelope power of such stations ~~does not exceed 1 kW~~ shall be limited to the lowest value to maintain reliable communications, not to exceed 5 kW. The use of 6 516 kHz for this purpose should be limited to daytime operation (see also No. **S52.221.1**).

Reasons: Consequential to **MOD S52.219**.

USA/1.7/ 65
NOC

S52.224 § 99. 1) Before transmitting on the carrier frequencies 4 125 kHz, 6 215 kHz, 8 291 kHz, 12 290 kHz or 16 420 kHz a station shall listen on the frequency for a reasonable period to make sure that no distress traffic is being sent (see Recommendation ITU-R M.1171).

Reasons: It may not be a simple task to monitor the ship transmit frequency when set to a duplex calling channel, and look forward to any proposal to help this situation.

USA/1.7/ 66
MOD

S52.227 2) The frequencies to be used for the conduct of simplex radiotelephony are shown in Appendix **S17**, Sub-Section B. In these cases, the peak envelope power of the coast station transmitter shall not exceed 1 kW.

Reasons: Editorial.

APPENDIX S17

Frequencies and channelling arrangements in the high-frequency bands for the maritime mobile service

(See Article **S52**)

USA/1.7/ 67
NOC

PART A – Table of subdivided bands

PART B – Channelling arrangements

Section I – Radiotelephony

USA/1.7/ 68
NOC

5. The following frequencies in Sub-Section A are allocated for calling purposes:

- (Channel No. 421 in the 4 MHz band);
- (Channel No. 606 in the 6 MHz band);
- (Channel No. 821 in the 8 MHz band);
- (Channel No. 1221 in the 12 MHz band);
- (Channel No. 1621 in the 16 MHz band);
- (Channel No. 1806 in the 18 MHz band);
- (Channel No. 2221 in the 22 MHz band);
- (Channel No. 2510 in the 25 MHz band).

The remaining frequencies in Sub-Sections A, B, C-1 and C-2 are working frequencies.

Reasons: Conversion to simplex operation is not necessary.

USA/1.7/ 69
NOC

5A For the use of the carrier frequencies:

- 4 125 kHz (Channel No. 421)
- 6 215 kHz (Channel No. 606)
- 8 291 kHz (Channel No. 833)
- 12 290 kHz (Channel No. 1221)
- 16 420 kHz (Channel No. 1621)

In Sub-Section A, by coast and ship stations for distress and safety purposes, see Article **S31** and Appendix **S13**.

Reasons: Conversion to simplex operation is not necessary.

SUB-SECTION A

USA/1.7 / 70
NOC

Table of single-sideband transmitting frequencies (kHz) for duplex (two-frequency) operation

Reasons: Conversion to simplex operation is not necessary.

USA/1.7 / 71
NOC

APPENDIX S27

Frequency allotment Plan for the aeronautical mobile (R) service and related information

Reasons: ICAO in consultation with the ITU-R should perform any review of Appendix S27, if necessary. The HF bands allocated to the aeronautical mobile (R) service are nearly saturated by the use of analog voice communications. This spectrum must be maintained for the new digital high frequency data link (HF DL) communications. The world-wide implementation of HF DL communications will reduce the burden on voice communications between pilots and controllers by using the data link for routine communications and freeing voice communications for more critical communications.

USA/1.7 / 72
MOD

RESOLUTION 207 (~~Mob-87~~Rev. WRC-2000)

Unauthorized use of frequencies in the bands allocated to the maritime mobile service and to the aeronautical mobile (R) service

The World Administrative Radio Conference for the Mobile Services, Geneva,
~~1987~~(Istanbul, 2000),

considering

Reasons: Editorial changes

USA/1.7 / 73
MOD

a) that provisions of the Radio Regulations prohibit the unauthorized use of
certain frequencies for other than safety related communications;

Reasons: Add protection for the distress and safety frequencies.

USA/1.7 / 74
MOD

b) that enforcing compliance with these regulatory provision is becoming
increasing difficult with the availability of low-cost HF SSB transceivers;

Reasons: Add protection for the distress and safety frequencies.

USA/1.7 / 75
MOD

c) that monitoring observations of the use of frequencies in the band 2 170-
2 194 kHz and in the bands allocated exclusively to the maritime mobile service

between 4 063 kHz and 27 500 kHz and to the aeronautical mobile (R) service between 2 850 kHz and 22 000 kHz show that a number of frequencies in these bands are still being used by stations of other services, some of which are operating in contravention of No. **S23.2**;

bd) that these stations are causing harmful interference to the maritime mobile and aeronautical mobile (R) services;

ee) that radio is the sole means of communication for the maritime mobile service and that certain frequencies in the bands mentioned in *considering a*) are reserved for distress and safety purposes;

df) that radio is the sole means of communication for the aeronautical mobile (R) service and that this is a safety service,

Reasons: Consequential numbering changes.

USA/1.7 / 76
NOC

g) that this Conference has reviewed the use of HF bands by the aeronautical mobile (R) and maritime mobile services with a view to protecting the operational, distress and safety communications [and has adopted Resolution [HF] (WRC-2000) to study the future technical and operational needs for the existing distress and safety frequencies and possible solutions to provide for efficient and effective distress, safety and other communications beyond the year 2000].

Reasons: This proposal would require studies be performed with a view of increasing the protection of HF distress and safety communications. These studies would also be tasked with providing efficient and effective solution for distress and safety communications in the future.

considering in particular

USA/1.7 / 77
NOC

eh) that it is of paramount importance that the distress and safety channels of the maritime mobile service be kept free from harmful interference, since they are essential for the protection of the safety of life and property;

fi) that it is also of paramount importance that channels directly concerned with the safe and regular conduct of aircraft operations be kept free from harmful interference, since they are essential for the safety of life and property,

Reasons: Consequential numbering changes

resolves

to urge administrations

1 to ensure that stations of services other than the maritime mobile service abstain from using frequencies in distress and safety channels and their guard bands and in the bands allocated exclusively to that service, except under the conditions expressly specified in Nos. **S4.4, S5.128, S5.129, S5.137 and S4.13** to

S4.15; and to ensure that stations of services other than the aeronautical mobile (R) service refrain from using frequencies allocated to that service except under the conditions expressly specified in Nos. **S4.4** and **S4.13**;

2 to make every effort to identify and locate the source of any unauthorized emission capable of endangering human life or property and the safe and regular conduct of aircraft operations, and to communicate their findings to the Radiocommunication Bureau;

3 to participate in the monitoring programmes that the Bureau may organize pursuant to this Resolution;

4 to make every effort to ensure that such emissions are made in appropriate bands allocated to services other than the maritime mobile service or the aeronautical mobile (R) service;

**USA/1.7 / 78
MOD**

5 to request their competent authorities to take, within their respective jurisdiction, such legislative or regulatory measures which they consider necessary or appropriate in order to prevent stations from unauthorized use of distress and safety channels or operating in contravention of No. **S23.2**,

Reasons: Adding clarity

**USA/1.7 / 79
MOD**

to invite the Radiocommunication Bureau

Reasons: Editorial

**USA/1.7 / 80
MOD**

1 to study the possible solutions, technical and regulatory, to assist in mitigating HF interference

Reasons: This proposal would require active study to solve or reduce this problem.

**USA/1.7 / 81
MOD**

~~4~~₂ to continue to organize monitoring programmes, at regular intervals, in the maritime distress and safety channels and their guard bands and in the bands allocated exclusively to the maritime mobile service between 4 063 kHz and 27 500 kHz and to the aeronautical mobile (R) service between 2 850 kHz and 22 000 kHz, with a view to ensuring the timely distribution of monitoring data and identifying the stations of other services operating on these channels or in these bands;

Reasons: This proposal would add the requirement for time distribution of monitoring data.

~~2~~₃ to seek the cooperation of administrations in identifying the sources of those emissions by all available means and in securing the cessation of those emissions;

~~34~~ when the station of another service transmitting in a band allocated to the maritime mobile service or to the aeronautical mobile (R) service has been identified, to inform the administration concerned,

Reasons: Consequential numbering changes.

USA/1.7 / 82
MOD

to invite the ITU-R and ITU-D

1 to increase regional awareness of appropriate practices to help mitigate interference in the HF bands, especially on distress and emergency channels;

2 to include the problem of interference to distress and emergency channels on the of regional radiocommunication and development seminars;

Reasons: This proposal would require active study to solve or reduce this problem.

requests administrations

to take all necessary steps in such cases to ensure the cessation of any transmissions contravening the provisions of the Radio Regulations on the frequencies or in the bands referred to in this Resolution.

USA/1.7 / 83
ADD

Draft Resolution [HF] (WRC-2000)

Technical and operational needs for distress and safety frequencies allocated to the maritime mobile service and the aeronautical mobile (R) service

The World Radiocommunication Conference (Istanbul, 2000),

considering

- a) that the HF frequencies currently used by the aeronautical and maritime mobile services for distress, safety and other communications, including allotted operational frequencies, suffer from harmful interference and are often subject to difficult propagation conditions;
- b) that WRC-97 considered some aspects of the use of HF bands for distress and safety communications on the context of the Global Maritime Distress and Safety System (GMDSS), especially with regard to regulatory measures;
- c) that existing regulatory measures prohibit the unauthorized use of certain frequencies for other than safety related traffic;
- d) that enforcing compliance with these regulatory measures is becoming increasingly difficult with the availability of low-cost HF SSB transceivers;

- e) that unauthorized operations using maritime and aeronautical HF frequencies are continuing to increase and are already a serious risk to HF distress, safety and other communications;
- f) that this Conference revised Resolution **207** regarding the unauthorized use of frequencies in the band allocated to the maritime mobile service and to the aeronautical mobile (R) service;
- g) that there is a need for a review of the frequency assignments and provisions for HF distress, safety and aeronautical mobile (R) service communications;
- h) that some administrations have resorted to the use of transmitting warning messages on operational HF channels as a means of deterring unauthorized users,

resolves to invite ITU-R

- 1 to study the future technical and operational needs for the existing distress and safety frequencies and possible solutions to provide for efficient and effective distress, safety and aeronautical mobile (R) service communications beyond the year 2000;
- 2 to report the results of the studies referred to in resolves 1 to WRC-2003,

further resolves

- 1 to urge all administrations and concerned organizations, including IMO and ICAO, to actively participate and contribute to the ITU-R studies;
- 2 to urge administrations to take all practical steps to comply with Resolutions **207 (Rev. WRC-2000)**

instructs the Secretary-General

to communicate this resolution to the attention of the International Maritime Organization and the International Civil Aviation Organization.

Reasons: This resolution would require active study to solve or reduce this problem.

Proposals for Agenda Item 1.8

to consider regulatory and technical provisions to enable earth stations located on board vessels to operate in the fixed-satellite service (FSS) networks in the bands 3 700 - 4 200 MHz and 5 925 - 6 425 MHz, including their coordination with other services allocated in these bands

Proposal for communications by earth stations on board vessels using frequencies allocated to the fixed-satellite service and used by existing space segment in the fixed-satellite service (27July99)

Background Information: This item concerns provision of communications by earth stations on board vessels using frequencies allocated to the fixed-satellite service and used by existing space segment in the fixed-satellite service. These stations operate in three distinct modes: at sea; while stationary in or near port; and in motion approaching or departing from port.

Operations at sea (beyond a certain distance for near-shore coordination) by earth stations on board vessels in the fixed-satellite service do not present a potential for interference to stations in the fixed service operating in accordance with the 6 GHz FS allocation, and therefore need not be coordinated. Operations while these earth stations are stationary at pre-determined points can be coordinated bilaterally with fixed service systems. Technical and regulatory issues concern the potential for interference between in-motion operations by these ESV earth stations operating close to shore and stations in the fixed service both on and offshore.

Attached is regulatory text that provides the framework for the authorization of earth stations on board vessels in the three different situations of operation; and through the application of constraints provides for the continued growth of terrestrial fixed services operating in accordance with the Radio Regulations.

There are a number of references to the distance [XXX] in the following proposal for Agenda Item 1.8. Determination of the [XXX] value or values must be accomplished before any regulatory/procedural proposals could be implemented.

Proposal:

3 700 - 4 200 MHz

	Allocation to services		
	Region 1	Region 2	Region 3
USA/1.8/84 MOD	3700-4200 FIXED FIXED-SATELLITE ADD S5.ESV Mobile	3700-4200 FIXED FIXED-SATELLITE (space-to-Earth) ADD S5.ESV MOBILE except aeronautical mobile	

Reasons: To establish regulatory and technical provisions for operations of ESV earth stations on board vessels in the fixed-satellite service.

5 925 - 6 425 MHz

**USA/1.8/85
MOD**

Allocation to services		
Region 1	Region 2	Region 3
5925-6425	FIXED FIXED-SATELLITE (Earth-to-space) ADD S5.ESV Moble S5.149 S5.440 S5.458	

Reasons: To establish regulatory and technical provisions for operations of earth stations on board vessels in the fixed-satellite service

**USA/1.8/ 86
ADD**

S5.ESV Earth stations located on board vessels may use frequencies in this band and shall operate in the fixed-satellite service in accordance with Resolution **ZZZ (WRC-2000)**.

Reasons: To establish regulatory and technical provisions for operations of earth stations on board vessels in the fixed-satellite service.

**USA/1.8/ 87
ADD**

Resolution ESV(WRC-2000)

Provisions to Enable Earth Stations Located on board Vessels to Operate in Fixed-Satellite Service Networks in the Bands 3 700-4 200 MHz and 5 925-6 425 MHz

The World Radiocommunication Conference (Istanbul, 2000),

considering

- that the technology exists that would permit the use of FSS networks by earth stations on board vessels (ESV) in the bands 3 700-4 200 MHz (space-to-Earth) and 5925-6425 MHz (Earth-to-space);
- that ESVs have the potential to cause unacceptable interference to fixed service systems in the band 5 925-6 425 MHz;
- that some administrations have been operating ESVs for several years under Radio Regulation S4.4;
- that ESV operations require considerably less than the full bandwidth in this FSS allocation and only a portion of the visible geostationary arc;
- that in order to ensure the protection and future growth of the FS, the ESV must operate with certain operational constraints;
- that the territory of an administration includes any off-shore structures or platforms with stations authorized by that administration;
- that a minimum distance from the territory of an administration can be calculated beyond which the ESV will not cause unacceptable interference to the fixed service in this band.

resolves

1. that an earth station on board a vessel (ESV) may be considered a station in the fixed-satellite service while receiving in the 3 700 - 4 200 MHz band and transmitting in the 5 925 - 6 425 MHz band;
2. that operation of ESVs that are at least [XXX] km from the territory of an administration in which stations in the fixed service operating in accordance with the Radio Regulations require no coordination or agreement;
3. that an ESV may be operated, either at a stationary position or while in motion, within [XXX] km from the territory of an administration with any fixed service station operating in accordance with the Radio Regulations using the bands 3 700 - 4 200 MHz (space-to-Earth) and 5 925 - 6 425 (Earth-to-space) of the fixed-satellite service, subject to the following:
 - (a) the authority for operating on radio frequencies within [XXX] km of territory on which such stations in the fixed service are operating belongs with the Administration responsible for that territory; however, the responsibility for the ESV lies with the Administration that authorized the use of the ESV,
 - (b) The administration that authorizes the use of the ESV in these bands shall ensure that such stations do not cause unacceptable interference to stations in the fixed service which themselves are established and operated in accordance with the Radio Regulations;
 - (c) Before ESVs operate in the fixed-satellite service in these bands:
 - (i) a set of frequencies will be established in each area of intended operation for such use that have been coordinated with all other potentially affected users;
 - (ii) this set of frequencies will include only the necessary spectrum per vessel in these bands (maximum necessary bandwidth per ESV is 2.346 MHz);
 - (iii) coordination will be accomplished between the Administration(s) with authority over the potentially affected fixed service stations operating in these bands and the Administration that authorizes the ESV to operate while stationary in these bands; in accordance with the **S9.17** provisions of the Radio Regulations;
 - (iv) upon completion of such coordination, the ESV will be authorized to operate in the fixed-satellite

service subject to appropriate operational constraints in these bands;

- (a) a list of the ESVs authorized to operate within [XXX] km of territory on which stations in the fixed service are operating in accordance with the Radio Regulations, the frequencies used and associated operational conditions that have been coordinated shall be established and maintained by the Administration responsible for the territory in which the fixed service stations are located; such list shall include a point of contact for obtaining this information;
 - (b) ESV operators must comply with the conditions established by the authorizing Administration(s); ESV use will be limited to the areas specified in the authorization with all of the constraints including minimum speeds.
1. that coordination of in-motion ESVs within [XXX] km of all stations in the fixed service operating in accordance with the Radio Regulations shall be accomplished using the provisions of the Annex to this Resolution.
 2. that every ESV operating under this provision shall be equipped with an automatic mechanism for continuously determining the location of the vessel and disabling operations in the event the vessel is within [XXX] km of the territory of an administration with stations in the fixed service operating in accordance with the Radio Regulations or that the ESV is outside any geographic area where its operation has been coordinated. The ESV shall also incorporate an automatic mechanism to terminate transmissions (a) when the antenna subsystem loses lock on the satellite and/or the ability to maintain tracking accuracy; or (b) when the antenna elevation drops below the ten degree required minimum elevation angle or (c) or when any operating parameter fails to meet the constraints established in the terms of the coordination agreement.
 3. that Administrations that authorize the use of the ESV shall ensure that personnel of vessels with ESVs are adequately qualified and certificated in accordance with the requirements of those Administrations to ensure the proper operation of the ESVs in accordance with the provisions of this Resolution.
 4. that the operator of the ESV shall, as appropriate, provide evidence of the basis for the authority under which the station is operating (e.g. license or certification). When such authority cannot be produced or when manifest irregularities are observed, Administrations in whose territory vessels equipped with ESVs are visiting may inspect the ESV installations in order to satisfy themselves that the ESVs conform to the conditions imposed by this resolution, including the capability indicated in section 5.
 5. that Administrations which authorize the use of the ESV shall ensure that the ESV shall be capable of operating in compliance with the requirements of this Resolution.

**USE OF ESVS WHILE IN MOTION WITHIN THE
DISTANCE [XXX] km IN THE BANDS 3700-4200 MHz AND 5925-6425
MHz**

1. Unless otherwise provided in a bilateral coordination agreement, the minimum constraints on ESVs shall include:
 - a. minimum diameter of the ESV antenna must be at least 2.4 m;
 - b. minimum antenna elevation angle must be at least 10 degrees;
 - c. maximum necessary bandwidth/vessel: 2.346 MHz;
 - d. maximum necessary bandwidth in a single operating area: 36 MHz;
 - e. maximum ESV transmitter power spectral density 17 dB(W/MHz)
(at input to the antenna);
 - f. minimum satellite tracking accuracy of 0.2 degrees;
 - g. maximum half-power antenna beamwidth of 1.5 degrees
1. The ESV transmissions from vessels within [XXX] km of stations in the fixed service operating in accordance with the Radio Regulations shall be based on agreements between the administrations concerned.
2. In order not to inhibit the growth of the fixed service, authorizations and agreements for the use of these frequencies by ESVs in accordance with the conditions of the coordinations shall extend for a fixed period of time (e.g. 1-3 years), but may be renewed;
3. ESVs will not claim protection while in motion from fixed service station transmissions.
4. Methods for establishing the basis for ESV use of frequencies in this band should be based on the most recent Recommendations of the ITU-R applicable to sharing between the fixed service and ESV use of the band.

Reasons: To establish regulatory and technical provisions for operations of earth stations on board vessels in the fixed-satellite service.

Proposals for Agenda Item 1.9

to take into account the results of ITU-R studies in evaluating the feasibility of an allocation in the space-to-Earth direction to the mobile-satellite service in a portion of the 1 559 - 1 567 MHz frequency range, in response to Resolutions **213** and **220** (WRC-97)

Proposal for no allocation for the Mobile Satellite Service (space-to-Earth) in any portion of the 1559 - 1567 MHz under agenda item 1.9 (20March99)

Background Information: Proposals were made to WRC-97 to reallocate portions of the 1 559 - 1 610 MHz band which, with the exception of a fixed service allocation in some countries, currently is exclusively allocated to the radionavigation satellite service and aeronautical radionavigation service worldwide. Other proposals were made not to change the existing allocations in these bands. In Resolution **220 (WRC-97)**, the ITU-R was requested to study, as a matter of urgency, the technical criteria and operational and safety requirements to determine if sharing between the aeronautical radionavigation and radionavigation-satellite services, operating or planned to be operate, in the band 1559-1610 MHz, and the mobile-satellite service in a portion of the 1559-1567 MHz frequency range, is feasible, taking into account the essential need to protect systems operating in the aeronautical radionavigation and radionavigation-satellite services in the band 1559-1610 MHz.

There are millions of RNSS receivers in use today for a wide range of applications, including safety-of-life-critical navigation on land, at sea, and in the air. Today, most of these receivers operate with the Global Positioning System (GPS), an important element of the Global Navigation Satellite System (GNSS) that operates in the 1 559 - 1 610 MHz band.

GPS provides position and time information to users by means of one-way transmissions using RNSS (space-to-Earth) allocations. GPS is information technology that uses systems of hardware and software, as well as information (time and ephemeris) transmitted from satellites to provide derived information to the user.

GLONASS and GPS are established elements of the International Civil Aviation Organization (ICAO) GNSS, operating in the band 1 559 - 1 610 MHz. These systems are accepted by the ICAO Council for use in international civil aviation. ICAO is currently developing Standards and Recommended Practices for international application in civil aviation. The GNSS will be used during all phases of flight, including precision approaches and landing, and under all weather conditions. The latter places extensive requirements on the performance characteristics of the system. The aeronautical use of RNSS is recognized in the Radio Regulations as a safety-of-life application. GPS is the sole basis for the formation of International Atomic Time and Coordinated Universal Time (UTC) by the International Bureau of Weights and Measures. GPS is also the primary means by which clocks are synchronized within telecommunications networks for Time Division Multiple Access transmissions. Time and frequency functions are or will be available on other RNSS systems.

As Resolution **220 (WRC-97)** recognizes RNSS and ARNS systems are evolutionary and other types of GNSS are under development for operation in the band 1 559 - 1 610 MHz. There are both aeronautical and non-aeronautical safety-of-life services in the 1 559 - 1 610 MHz band, and it is well established that there is an essential need to protect systems operating in the ARNS and RNSS.

The core signal structures of the MSS and the RNSS and ARNS are fundamentally different: MSS uses a two-way signal while ARNS and RNSS transmits a weak, receive-only signal. Having systems from a radiocommunication service operate on a co-primary, co-frequency basis in the 1 559 - 1 610 MHz band would limit ARNS and RNSS operators' flexibility to adjust their spectrum usage, and would hamper efforts to develop a GNSS that is capable of meeting evolving international needs and of providing adequate protection for international civil use worldwide.

Studies undertaken in the ITU addressed current aeronautical radionavigation and radionavigation-satellite service systems, as well as future radionavigation services planned for this band.

These studies reached the following conclusions:

- MSS (space-to-Earth) and ARNS/RNSS are fundamentally incompatible in any portion of the 1559-1567 MHz band. Not only do MSS signals disrupt ARNS/RNSS, but GNSS pseudolites disrupt MSS signals.
- The -112 dB(W/m²/MHz) power flux-density level at the Earth's surface that is mentioned in Resolution 220 clearly would not protect existing RNSS systems (such as GPS) from harmful interference.
- The RNSS is extensively used, and is continuing to undergo a tremendous expansion which drives further evolution. These factors, along with the many critical timing, positioning, and navigation uses of RNSS sharing of the 1559-1610 MHz band, weigh conclusively against sharing any portion of the band segment at 1559-1567 MHz with any co-frequency communication service.
- The use of pseudolites in the ARNS/RNSS bands at 1559-1567 MHz is in its early stages, but is expected to increase in terms of numbers, geographic scope, and complete utilization of the frequency band in the near future. This use is incompatible with co-frequency MSS (space-to-Earth).

Proposals:

USA/1.9/89 NOC

The United States proposes that no allocation be made to the Mobile Satellite Service (space-to-Earth) in any portion of the 1559 - 1567 MHz band under agenda item 1.9.

Reasons: The current allocation, 1 559 - 1 610 MHz, is required for radionavigation services, including critical aeronautical safety applications, on a worldwide basis. Based on studies conducted in the ITU-R pursuant to Resolution 220, sharing in this band with communications services such as the mobile-satellite service (space-to-Earth) is not possible.

USA/1.9/90 SUP

~~RESOLUTION 220 (WRC-97)~~

~~Studies to consider the feasibility of use of~~

**~~a portion of the band 1559-1610 MHz by the
mobile-satellite service (space-to-Earth)~~**

Reasons: Studies performed by the ITU-R show that co-frequency sharing between the mobile-satellite service and the radionavigation-satellite and aeronautical radionavigation services within the band 1559 - 1567 MHz is not feasible. The ITU-R studies satisfy the requirement of Resolution **220 (WRC-97)**. As a result, Resolution **220** should be suppressed.

Proposals for Agenda Item 1.11

to consider constraints on existing allocations and to consider additional allocations on a worldwide basis for the non-GSO/MSS below 1 GHz, taking account the results of ITU studies conducted in response to Res. **214** (Rev. WRC-97) and **219** (WRC-97);

Proposal for the Tables of Criteria Applicable to MSS allocations for the non-GSO systems below 1 GHz (20March99)

Background Information: A number of studies have been carried out since MSS allocations for non-GSO satellite systems were first agreed at WARC-92. These have led to ITU-R Recommendations which indicate the sharing techniques which are being used by those systems to share with each other and other co-primary services.

The table below (Non-GSO MSS Sharing Summary) from Recommendation ITU-RM.[YA] “Methods for achieving coordinated use of multiple non-GSO MSS systems below 1 GHz and sharing with other services in existing MSS allocations” summarizes the techniques and Recommendations applied to existing MSS allocations. Many of these techniques are being employed in practice successfully.

Non-GSO MSS Sharing Summary

	Narrow-band	Wideband
Fixed and mobile (148-149.9 MHz) (455-456 MHz and (459-460 MHz in Region 2) (454-455 MHz by footnotes)	Combination: - Dynamic channel avoidance (Rec. ITU-R M.1039) - Low duty cycle - Brief message duration - (Rec.ITU-R M. 1185)	Combination: - Low output power density - Brief message duration - Low data rate - Filtering at satellite - Geographical separation
Fixes and mobile (137-138 MHz) (400.15-401 MHz)	Ground level pfd per RR S5.208	Ground level pfd per RR S5.208
Meteorological satellites (137-138 MHz)* (400.15-401 MHz)	Assignment separation	Combination: - Low pfd at ground level - Cross polarization discrimination - Adaptive filter at satellite
Space operations Space research (137-138 MHz)	Channel avoidance	Combination: - Low pfd - Cross polarization discrimination
Space research (400.15-401 MHz)	Channel avoidance	Combination: - Low pfd - Cross polarization discrimination
Meteorological aids (400.15-401 MHz)	Channel avoidance	Combination: - Low pfd - Cross polarization discrimination

The constraints on existing allocations are reflected in the footnotes to the allocations, and in the Annex 1 to Appendix **S5**. These have evolved to their present form since WARC-92, and now reflect a balance with regard to sharing criteria among the primary services concerned.

These constraints have served to provide a basis for implementing non-GSO MSS systems in these bands and at the same time provide protection to other space and terrestrial services. Therefore in respect to the constraints of the MSS in existing allocations below 1 GHz, no further modifications are needed.

Proposals:

USA/1.11/91
NOC **S9.11A** *e)* for a station for which the requirement to coordinate is included in a footnote of the Table of Frequency Allocations referring to this provision:

Reasons: No modifications are required to the Tables of Criteria applicable to MSS allocations for the non-GSO systems below 1 GHz as found in No **S9.11A**, or to the footnotes containing constraints which apply to the pertinent allocations.

APPENDIX S5

ANNEX 1

- 1 Coordination thresholds for sharing between MSS (space-to-Earth) and terrestrial services in the same frequency bands and between non-GSO MSS feeder links (space-to-Earth) and terrestrial services in the same frequency bands

1.1 Below 1 GHz

USA/1.11/92
NOC 1.1.1 In the bands 137-138 MHz and 400.15-401 MHz, coordination of a space station of the MSS (space-to-Earth) with respect to terrestrial services (except aeronautical mobile (OR) service networks operated by the administrations listed in Nos. **S5.204** and **S5.206** as of 1 November 1996) is required only if the pfd produced by this space station exceeds -125 dB (W/m²/4 kHz) at the Earth's surface.

Reasons: No modifications are required to the Tables of Criteria applicable to MSS allocations for the non-GSO systems below 1 GHz as found in No. **S9.11A**, or to the footnotes containing constraints which apply to the pertinent allocations.

USA/1.11/93
NOC 1.1.2 In the band 137-138 MHz, coordination of a space station of the MSS (space-to-Earth) with respect to the aeronautical mobile (OR) service is required only if the pfd produced by this space station at the Earth's surface exceeds:

- –125 dB (W/m²/4 kHz) for networks for which complete Appendix **3** coordination information has been received by the Bureau prior to 1 November 1996;
- –140 dB (W/m²/4 kHz) for networks for which complete Appendix **S4/3** coordination information has been received by the Bureau after 1 November 1996 for the administrations referred to in § 1.1.1 above.

Reasons: No modifications are required to the Tables of Criteria applicable to MSS allocations for the non-GSO systems below 1 GHz as found in No. **S9.11A**, or to the footnotes containing constraints which apply to the pertinent allocations.

USA/1.11/94
NOC

1.1.3 In the band 137-138 MHz, coordination is also required for a space station on a replacement satellite of a MSS network for which complete Appendix 3 coordination information has been received by the Bureau prior to 1 November 1996 and the pfd exceeds -125 dB(W/m²/4 kHz) at the Earth's surface for the administrations referred to in § 1.1.1 above.

Reasons: No modifications are required to the Tables of Criteria applicable to MSS allocations for the non-GSO systems below 1 GHz as found in No. **S9.11A**, or to the footnotes containing constraints which apply to the pertinent allocations.

3.2 General considerations

USA/1.11/95
NOC

TABLE 1
Earth stations operating at frequencies below 1 GHz

Reasons: No modifications are required to the Tables of criteria applicable to MSS allocations for use by Non-GSO systems below 1 GHz, as found in No. **S9.11A**, or to the footnotes containing constraints which apply to the pertinent allocations.

Proposals for Agenda Item 1.12

to consider progress of studies on sharing between feederlinks of non-geostationary satellite networks in the mobile satellite service and geostationary-satellite networks in the fixed satellite service in the bands 19.3-19.7 GHz and 29.1-29.5 GHz, taking into account Resolution **121** (Rev.WRC-97)

Proposal for the modification of S5.541A and the suppression of Res 121 (20March99)

Background Information: Resolution **121** requests that the ITU-R conduct a study of sharing possibilities between GSO FSS and NGSO MSS feederlinks in the bands. In response ITU-R WP-4A of Study Group 4 has agreed a Draft New Recommendation, "Mitigation Techniques to Facilitate Coordination in the 20/30 GHz NGSO MSS Feederlinks".

The Recommendation includes the topics of Adaptive Power Control, High Gain Antennas, Geographic Isolation, Site Diversity and Link Balancing.

This Recommendation is considered to have covered the requirements of Resolution **121** (**Rev. WRC-97**) and thus satisfies the agenda.

Proposals:

USA/1.12/96

MOD

S5.541A Feeder links of non-geostationary networks in the mobile-satellite service and geostationary networks in the fixed-satellite service operating in the band 29.1-29.5 GHz (Earth-to-space) shall employ uplink adaptive power control or other methods of fade compensation, such that the earth station transmissions shall be conducted at the power level required to meet the desired link performance while reducing the level of mutual interference between both networks. These methods shall apply to networks for which Appendix **S4** coordination information is considered as having been received by the Bureau after 17 May 1996 and until they are changed by a future competent world radiocommunication conference. Administrations submitting Appendix **S4** information for coordination before this date are encouraged to utilize these techniques to the extent practicable. ~~These methods are also subject to review by ITU-R (see Resolution **121** (Rev.WRC-97)).~~

Reasons: The objective of Resolution **121** has been addressed through the development of a Draft New Recommendation in Study Group 4 of the ITU-R.

USA/1.12/97

RESOLUTION 121 (Rev.WRC-97)

SUP

~~Continued development of interference criteria and methodologies for fixed-satellite service coordination between feeder links of non-geostationary satellite networks in the mobile-satellite service and geostationary satellite networks in the fixed-satellite service in the bands 19.3-19.7 GHz and 29.1-29.5 GHz~~

Reasons: The objectives of Resolution **121** have been met.

Proposal for Agenda Item 1.13.1

to review and, if appropriate, revise the power limits appearing in Articles **S21** and **S22** in relation to the sharing conditions among non-GSO FSS, GSO FSS, GSO broadcasting-satellite service (BSS), space sciences and terrestrial services, to ensure the feasibility of these power limits and that these limits do not impose undue constraints on the development of these systems and services;

Proposals to require coordination between NGSO FSS transmitting space stations and GSO receive earth stations with very large antenna, including additions and/or modifications to Articles S5, S9, S22, Appendices S4 and S5 (4August99)

Background Information: WRC-97 adopted provisional power flux density limits in certain frequency bands which would apply to non-GSO FSS systems to protect GSO FSS networks, and GSO BSS networks. Resolution **130** (WRC-97), *Use of Non-Geostationary Systems in the Fixed-Satellite Service in Certain Frequency Bands*, and Article **S22** of the Radio Regulations contain limits corresponding to an interference level caused by one non-GSO system in the frequency bands 10.7-12.75 GHz, 17.8-18.6 GHz, and 19.7-20.2 GHz. Studies demonstrate that neither the WRC-97 provisional EPFD_{down} limits and associated percentages of time nor the proposed modifications agreed during ITU-R studies adequately protect existing GSO FSS networks with very large earth station antennas. Section 3.1.2 of the draft CPM report for WRC-2000 concludes that transmissions to earth stations with very large antennas need to be protected and that an additional regulatory procedure would be necessary. Coordination triggers and example regulatory and procedural text were also agreed. Building on the draft CPM report text, this proposal includes additions and/or modifications to Articles **S9** and **S22** and Appendices **S4** and **S5** to require coordination between non-GSO FSS transmitting space stations and GSO receive earth stations with very large earth station antennas.

Proposal:

ARTICLE S9

Sub-Section IIA – Requirement and request for coordination

- | | |
|-----------------------------|---|
| USA/1.13/98
ADD | S9.7A a1) ^{11, 12} for a specific earth station within a geostationary-satellite network in the fixed-satellite service in certain frequency bands in respect of a non-geostationary satellite system in the fixed-satellite service; |
| USA/1.13/99
ADD | S9.7B a2) ^{11, 12} for a non-geostationary-satellite system in the fixed-satellite service in certain frequency bands in respect of a specific earth station within a geostationary satellite network in the fixed-satellite service; |
| USA/1.13/100
MOD | ¹¹ S9.6.2 In all cases, the coordination of an earth station with terrestrial stations, <u>non-geostationary satellite systems</u> , or other earth stations operating in the opposite direction of transmission shall remain within the authority of the administration on the territory of which this station is located. |

- USA/1.13/101
MOD
- ¹² **S9.7A.1 and S9.7.B.1** Coordination information relating to a specific earth station received by the Bureau prior to 1 August 2000 is considered as complete S9.7A and S9.7B information from the date of receipt of complete information of the associated satellite network under S9.7 provided that the characteristics of the specific earth stations are within the parameters of any typical earth station included in the GSO FSS network coordination request. S9.8.1 and S9.9.1 Application of this provision with respect to Articles 6 and 7 of Appendices S30 and S30A is suspended pending a decision of WRC-99 on the revision of these two Appendices.
- USA/1.13/102
MOD
- ¹²¹³ **S9.8.1 and S9.9.1** Application of this provision with respect to Articles 6 and 7 of Appendices S30 and S30A is suspended pending a decision of WRC-99 on the revision of these two Appendices.

Reasons: GSO FSS earth stations with very large antennas are not adequately protected by the EPFD_{down} limits contained in Table MOD S22-1 and case-by-case coordination of systems operating co-frequency, co-directional links in the space-to-Earth direction is needed. The proposed ADD S9.7A and ADD S9.7B would require coordination between non-GSO FSS transmit satellites and GSO FSS receive earth stations with very large antennas. By referring to coordination provisions under S9.7A and S9.7B, the request for coordination would be sent by the requesting administration to the Bureau under S9.30. The Bureau would act under S9.34 to identify administrations with which coordination may need to be effected and publish the information in the Weekly Circular. Since coordination between a non-GSO FSS space station and very large GSO FSS earth stations is a new type of coordination that does not currently exist in Article S9, it is necessary to add two new entry points in Article S9:

- One entry point to enable the non-GSO space station administration to request coordination with administrations having specific very large earth station antennas located on their territory.
- Another entry point to enable the reciprocal coordination to take place, i.e. the possibility for an administration planning to implement a specific very large GSO earth station stations located on their territory to request coordination with administrations having non-GSO FSS transmit space.

Article S22

Section II – Control of interference to geostationary-satellite systems

USA/1.13/103 ADD	TABLE S22-1 ¹ Limits to the EPFD_{down} radiated by non-GSO FSS systems in certain frequency bands
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USA/1.13/104
ADD

¹ For certain receive earth stations, see also **ADD S9.7A** and **ADD S9.7B**.

Reasons: The EPFD_{down} limits contained in **Table S22-1** do not adequately protect earth stations in geostationary satellite networks in the fixed-satellite service with very large antennas. The proposed **ADD S9.7A** and **ADD S9.7B** require case-by-case coordination.

USA/1.13/105
ADD

TABLE S22-4^{1,3}

Operational Limits to the EPFD_{down} radiated by non-GSO FSS systems in certain frequency bands

USA/1.13/106
ADD

³ For certain receive earth stations, see also **ADD S9.7A** and **ADD S9.7B**.

Reasons: The Operational EPFD_{down} limits contained in **Table S22-4** do not adequately protect earth stations in geostationary satellite networks in the fixed-satellite service with very large antennas. The proposed **ADD S9.7A** and **ADD S9.7B** require case-by-case coordination.

APPENDIX S4

ANNEX 2B (to Appendix S4)

Table of characteristics to be submitted for space and radio astronomy services

C – Characteristics to be provided for each group of frequency assignments for a satellite antenna beam or an earth station antenna

(The modifications shown below need to be incorporated into the full table.)

USA/1.13/107
MOD

Items in Appendix	Notification or coordination of a GSO network (including Appendix S30B)	Notification or coordination of an earth station
C.1		
C.2.a	X	X
C.2.b		
C.3.a	X	X
C.3.b		
C.4	X	X
C.5a	X	

C.5.b		X
C.5.c		
C.6	X	X
C.7.a	X ⁹	X ⁹
C.7.b	C ⁹	C ⁹
C.7.c	C ⁹	C ⁹
C.7.d	C	C
C.8.a	X ⁷	C ⁸
C.8.b	X ⁷	X
C.8.c	X ⁶	X ⁶
C.8.d	X ²	
C.8.e	X ⁶	X ⁶
C.8.f		
C.8.g	C ⁴	C ^{4,5}
C.8.h		
C.8.i		
C.8.j		
C.9.a	C	
C.9.b		
C.9.c		
C.10.a	X ⁹	C ⁹
C.10.b	X ⁹	C ⁹
C.10.c.1	X ⁹	C ⁹
C.10.c.2	X ⁹	C ⁹
C.10.c.3	X	
C.10.c.4	X	
C.10.c.5	X ⁹	C ⁹
C.10.c.6		
C.11.a	X	
C.11.b		
C.11.c		
C.11.d		
C.12		
C.13		
C.14		

- X Mandatory information
O Optional information
C This information need only be furnished when it has been used as a basis to effect coordination with another administration.

⁹ Information mandatory for coordination under No. **ADD S9.7A**.

D – Overall link characteristics

(The modifications shown below need to be incorporated into the full table.)

USA/1.13/108
MOD

Items in Appendix	Notification or coordination of a GSO network (including Appendix S30B)	Notification or coordination of an earth station
D.1	X	
D.2.a	X ⁹	C ⁹
D.2.b	X	

X Mandatory information O Optional information C This information need only be furnished when it has been used as a basis to effect coordination with another administration.

⁹ Information mandatory for coordination under No. **ADD S9.7A**.

Reasons: This is consequential to **ADD S9.7A** and **ADD S9.7B**. Administrations will need to submit specific information for earth stations associated with geostationary-satellite networks in the fixed-satellite service meeting the conditions in the proposed addition to Appendix **S5**. Since there is no requirement to give the specific locations of earth stations today, there may need to be a resolution written to have typical earth stations associated with GSO FSS networks, already in coordination or notified, that meet the criteria to be brought in as specific earth stations. In this resolution, there will have to be some guidance on priorities. The modifications in column two for "Notification or coordination of a GSO network (including Appendix **S30B**)" would apply to earth stations associated with GSO FSS networks already in coordination or notified while the modifications in column three for "Notification or coordination of an earth station" would apply to earth stations communicated to the Bureau after WRC-2000. Additional guidance will need to be added to the *Instructions for Filling Out the Form of Notice ApS4/II and ApS4/III Relating to Space Radiocommunication Stations* distributed by CR/65.

APPENDIX S5

Identification of administrations with which coordination is to be effected or agreement sought under the provisions of Article S9

Table S5-1

Technical conditions for coordination

(see Article **S9**)

USA/1.13/109
ADD

Reference of Article S9	Case	Frequency bands (and Region) of the service for which coordination is sought	Threshold/condition	Calculation method	Remarks
No. S9.7A GSO earth station/ non-GSO system	A specific earth station in a geostationary satellite network in the fixed-satellite service in respect of a non-geostationary-satellite system in the fixed-satellite service.	The following frequency bands: 10.7 - 11.7 GHz (space-to-Earth), 11.7 - 12.2 GHz (space-to-Earth) in Region 2, 12.2 - 12.75 GHz (space-to-Earth) in Region 3, 12.5 - 12.75 GHz (space-to-Earth) in Region 1, 17.8 - 18.6 GHz (space-to-Earth), and 19.7 - 20.2 GHz (space-to-Earth)	Conditions: i) the frequency bands overlap and ii) the satellite network using the geostationary-satellite orbit has specific receive earth stations and meets all of the following conditions: a) Earth station antenna maximum isotropic gain greater than or equal to 64 dBi for the frequency bands 10.7 - 12.75 GHz or 68 dBi for the frequency bands 17.8 - 18.6 GHz and 19.7 - 20.2 GHz; b) G/T of 44 dB/K or higher; c) space station emission bandwidth of 250 MHz or higher for the frequency bands 10.7 - 12.75 GHz or 800 MHz or higher for the frequency bands 17.8 - 18.6 GHz and 19.7 - 20.2 GHz;	i) compare frequency bands, ii) use the maximum antenna gain of the specific receive earth station (Appendix S4 C.10.c.2), noise temperature (Appendix S4 C.10.c.5 or D.2.a, as appropriate), and the space station emission bandwidth (Appendix S4 C.7.a) in the geostationary-satellite network as given in Appendix S4 data.	The thresholds/conditions for coordination do not apply to typical receive earth stations operating in satellite networks using the geostationary-satellite orbit.

No. S9.7B non-GSO system/ GSO earth station/	A non-geostationary-satellite system in the fixed-satellite service in respect of a specific earth station in a geostationary satellite network in the fixed satellite service.	The following frequency bands: 10.7 - 11.7 GHz (space-to-Earth), 11.7 - 12.2 GHz (space-to-Earth) in Region 2, 12.2 - 12.75 GHz (space-to-Earth) in Region 3, 12.5 - 12.75 GHz (space-to-Earth) in Region 1, 17.8 - 18.6 GHz (space-to-Earth), and 19.7 - 20.2 GHz (space-to-Earth)	Conditions: i) the frequency bands overlap and ii) the satellite network using the geostationary-satellite orbit has specific receive earth stations and meets all of the following conditions: a) Earth station antenna maximum isotropic gain greater than or equal to 64 dBi for the frequency bands 10.7 - 12.75 GHz or 68 dBi for the frequency bands 17.8 - 18.6 GHz and 19.7 - 20.2 GHz b) G/T of 44 dB/K or higher; c) Space station emission bandwidth of 250 MHz or higher for the frequency bands 10.7 - 12.75 GHz or 800 MHz or higher for the frequency bands 17.8 - 18.6 GHz and 19.7 - 20.2 GHz.	i) compare frequency bands, ii) use the maximum antenna gain of the specific receive earth station (Appendix S4 C.10.c.2), noise temperature (Appendix S4 C.10.c.5 or D.2.a, as appropriate), and the space station emission bandwidth (Appendix S4 C.7.a) in the geostationary-satellite network as given in Appendix S4 data.	The thresholds/conditions for coordination do not apply to typical receive earth stations operating in satellite networks using the geostationary-satellite orbit.
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Reasons: This adds the technical conditions for coordination between non-GSO FSS transmitting space stations and GSO receive earth stations with very large earth station antennas and is consequential to **ADD S9.7A** and **ADD S9.7B**.

Proposal to modify Articles S5 to clarify that there was no allocation to NGSO FSS (Earth-to-space) in the band 17.3-17.8 GHz in Region 2 (4August99)

USA/1.13/110

MOD

S5.516 The use of the bands 17.3-18.1 GHz by geostationary-satellite systems in the fixed-satellite service (Earth-to-space) is limited to feeder links for the broadcasting-satellite service. For the use of the band 17.3-17.8 GHz in Region 2 by feeder links for the broadcasting-satellite service in the band 12.2-12.7 GHz, see Article **S11**. The use of the bands 17.3-18.1 GHz (Earth-to-space) in Regions 1 and 3 and 17.8-18.1 GHz (Earth-to-space) in Region 2 by non-geostationary-satellite systems in the fixed-satellite service is subject to the application of the provisions of Resolution ~~538 (WRC-97)~~. No. **S9.12** for coordination between non-geostationary-satellite systems in the fixed service shall not claim protection from geostationary-satellite networks in the fixed satellite service operating in accordance with the Radio Regulations. The use of the band 17.3-17.8 GHz in Region 2 by systems in the fixed-satellite service (Earth-to-space) is limited to geostationary-satellites.

Reasons: Additional text to clarify the intent of the footnote. There is no allocation in the band 17.3-17.8 GHz in Region 2 for NGSO FSS (Earth-to-space). The possibility of an allocation was to be based on sharing studies between the NGSO FSS and the existing and planned services. Studies show that sharing between radiolocation stations and NGSO FSS networks is not feasible due to severe interference from operational radiolocation stations and these services are not compatible. In Region 2, the band 17.3-17.8 GHz is allocated to the BSS service beginning 1 April 2007. Studies show that transmit NGSO FSS earth stations are not compatible with receive BSS earth stations.

Proposal to NOC footnotes in Article S5 in the band 13.75-14.0 GHz

USA/1.13/111
NOC **S5.502**

USA/1.13/112
NOC **S5.503**

Reasons: To maintain the delicate sharing situation between the fixed-satellite, radiolocation, radionavigation, and space research/Earth exploration-satellite services, the requirements contained in the above footnotes cannot change. The restrictions specified in these footnotes are necessary for the protection of GSO FSS carriers from radar interference and also minimize the possibility of unacceptable interference to the radiolocation and radionavigation services. Studies show that there is a significant potential for unacceptable interference to NGSO FSS satellite receivers from radiolocation stations in the 13.75-14.0 GHz band.

Proposal to modify Articles S21 regarding pfd limits for non-geostationary satellites operating in the bands 10.7 – 12.75 GHz and 17.7 – 19.3 GHz for the protection of the fixed service (6August99)

Background Information: Resolution **131** (WRC-97) *invited ITU-R* “to study, as a matter of urgency, the appropriate power flux-density values to be applied to non-GSO networks in the bands 10.7 – 12.75 GHz and 17.7 – 19.3 GHz to ensure protection of the fixed service without unduly constraining the development of either type of network.” Resolution **131** requested WRC-00 “to review the provisional pfd limits referred to in *resolves* 1 (of RES131) based on the results of the studies carried out by ITU-R.” The ITU-R has confirmed the limits in the band 10.7 – 12.75 GHz and determined a new set of limits to replace the provisional limits established by WRC-97 in 17.7 – 19.3 GHz.

Proposals:

USA/1.13 / 113
MOD

TABLE S21-4 (continued)

Frequency band	Service*	Limit in dB(W/m ²) for angle of arrival (δ) above the horizontal plane			Reference bandwidth
		0°-5°	5°-25°	25°-90°	
10.7-11.7 GHz	Fixed-satellite (space-to-Earth), <u>geostationary-satellite orbit</u>	-150 ¹⁴	$-150 + 0.5(\delta - 5)^{14}$	-140 ¹⁴	4 kHz
<u>10.7-11.7 GHz</u>	<u>Fixed-satellite (space-to-Earth), non-geostationary-satellite orbit</u>	<u>-126</u>	<u>$-126 + 0.5(\delta - 5)$</u>	<u>-116</u>	<u>1 MHz</u>
11.7-12.5 GHz (Regions 1 and 3) <u>12.5-12.75 GHz (Region 1 and Region 3 countries listed in Nos. S5.494 and S5.496)</u> 11.7-12.72 GHz (Region 2) 11.7-12.2 GHz (Region 3) 12.2-12.7 GHz (Region 2)	Fixed-satellite (space-to-Earth), non-geostationary-satellite orbit	-148¹⁴ <u>-124</u>	$-148 + 0.5(\delta - 5)^{14}$ <u>$-124 + 0.5(\delta - 5)$</u>	-138¹⁴ <u>-114</u>	4 kHz <u>1 MHz</u>
12.2-12.5 GHz ⁷ (Region 3) 12.5-12.75 GHz ⁷ (Region 1 and Region 3 countries listed in Nos. S5.494 and S5.496)	Fixed-satellite (space-to-Earth), <u>geostationary-satellite orbit</u>	-148 ¹⁴	$-148 + 0.5(\delta - 5)^{14}$	-138 ¹⁴	4 kHz
17.7-19.3 GHz ^{7,8}	Fixed-satellite (space-to-Earth) Meteorological-satellite (space-to-Earth)	-115 ^{aa} or -125 <u>$-115 - X^{12}$</u>	$-115 + 0.5(\delta - 5)^{aa}$ or $-125 + (\delta - 5)$ <u>$-115 - X + ((10 + X)/20)(\delta - 5)^{12}$</u>	-105 ^{aa} or -105¹²	1 MHz

USA/1.13 / 114
ADD^{aa}

S21.16.6bis These limits apply to emissions of space stations on meteorological-satellites and on geostationary FSS satellites. These limits also apply to emissions of space stations on non-geostationary FSS satellites which were in operation or for which complete coordination or notification information had been received by the Radiocommunication Bureau: by 17 November 1995, in the bands 18.8-19.3 GHz; or by 22 November 1997, in the bands 17.7-18.8 GHz.

USA/1.13 / 115
MOD

¹² **S21.16.6** ~~These values shall apply provisionally only to emissions of space stations on non-geostationary satellites in networks operating with a large number of satellites, that is systems operating with more than 100 satellites (see Resolution 131 (WRC-97)).~~ These limits apply only to emissions of space stations on non-geostationary FSS satellites except those covered by **S21.16.6 bis** for which complete coordination or notification information, as appropriate, has been received by the Radiocommunication Bureau after 17 November 1995 in the bands 18.8-19.3 GHz or after 22 November 1997 in the bands 17.7-18.8 GHz and which were not operational by those dates. The function X is defined as a function of the number, N, of satellites in the non-GSO FSS constellation as follows:

$$\begin{aligned} & \text{— for } N \leq 50 && X = 0 \text{ (dB)} \\ & \text{— for } 50 < N \leq 288 && X = \frac{5}{119} (N - 50) \text{ (dB)} \\ & \text{— for } N > 288 && X = \frac{1}{69} (N + 402) \text{ (dB)} \end{aligned}$$

USA/1.13 / 116
SUP

¹⁴ **S21.16.8**

USA/1.13 / 117
SUP

¹⁵ **S21.16.9**

USA/1.13 / 118
SUP

~~RESOLUTION 131 (WRC-97)~~

~~Power flux-density limits applicable to non-geostationary fixed-satellite service systems for protection of terrestrial services in the bands 10.7-12.75 GHz and 17.7-19.3 GHz~~

Reasons: Replaces the provisional pfd limits in Table **S21-4** with the values that, as a result of extensive ITU-R studies, were agreed by WP 4-9S and JTG 4-9-11. **ADD^{aa} S21.16.6bis**, and a corresponding change in **MOD¹² S21.16.6**, specify the dates of application of the pfd limits in conformance with the dates established in **RES131**. Footnotes **S21.16.8**, **S21.16.9**, and **RES131** are no longer required.

Proposal for the protection of GSO FSS and BSS Networks from maximum aggregate epfd produced by multiple non-GSO FSS systems (13September99)

Background Information: The report of CPM-99 to WRC-2000 states that “[t]here is a need to provide a regulatory mechanism that would ensure protection of GSO FSS and GSO BSS networks from the maximum aggregate equivalent power flux-density produced by multiple non-GSO FSS systems in frequency bands where equivalent power flux-density (EPFD) limits have been adopted.” CPM-99 Report at Section 3.1.1.3.2. With respect specifically to the GSO BSS, Section 3.1.3.1.4(b) of the CPM-99 Report to WRC-2000 states that “[t]here is a need to ensure that the aggregate EPFD produced by all co-frequency non-GSO FSS systems does not exceed the maximum interference levels, as determined by the agreed to aggregate EPFD masks, that are necessary to protect these GSO BSS systems.”

The United States strongly agrees with these assessments, and believes that the required regulatory mechanism can only be provided in the form of aggregate limits that are included in Article **S22** or attached to a WRC-2000 Resolution. Because a WRC-2000 Resolution would be an acceptable mechanism, the United States proposes the Resolution included in the attachment, which is based in substantial part on studies performed in the ITU-R.

Proposals:

RESOLUTION WWW (WRC-2000)

USA/1.13 / 119
ADD

**PROTECTION OF GSO FSS AND GSO BSS NETWORKS FROM THE
MAXIMUM AGGREGATE EQUIVALENT POWER FLUX-DENSITY
PRODUCED BY MULTIPLE NON-GSO FSS SYSTEMS IN FREQUENCY
BANDS WHERE EPFD LIMITS HAVE BEEN ADOPTED**

The World Radiocommunication Conference (WRC-2000, Istanbul),

considering

- a) that WRC-97 has adopted, in Article **S22**, provisional EPFD limits to be met by non-GSO FSS systems in order to protect GSO FSS and GSO BSS networks in parts of the frequency range 10.7 - 30 GHz;
- b) that WRC-2000 has revised these limits to ensure that they provide adequate protection to GSO systems without causing undue constraints to any of the systems and services sharing these frequency bands;
- c) that Article **S22** includes single entry EPFD limits which apply to non-GSO FSS systems in these bands;
- d) that these single-entry limits have been derived from aggregate equivalent power flux-density (EPFD) masks that are intended to protect GSO networks, assuming a maximum effective number of non-GSO FSS systems of 3.5;

- e) that the aggregate interference caused by all co-frequency non-GSO FSS systems in these bands into GSO FSS systems should not exceed the maximum interference levels that are necessary to protect these GSO systems;
- f) that WRC-97 decided, and WRC-2000 confirmed, that non-GSO FSS systems in these bands are to coordinate the use of these frequencies between themselves under the provisions of No. **S9.12** of the Radio Regulations;
- g) that the orbital characteristics of such systems are likely to be inhomogeneous;
- h) that as a result of this likely inhomogeneity, the aggregate EPFD levels from multiple non-GSO FSS systems are not directly related to the number of actual systems sharing a frequency band, and the number of such systems operating co-frequency is likely to be small,

recognizing

- a) that non-GSO FSS systems are likely to need to implement interference mitigation techniques to share frequencies among themselves;
- b) that because the use of such interference mitigation techniques will likely keep the number of non-GSO systems small, the aggregate interference caused by non-GSO FSS systems into GSO systems will also likely be small;
- c) that notwithstanding *considering* d), there may be instances where the aggregate interference from non-GSO systems could exceed the interference levels given in Annex 1;
- d) that administrations operating GSO systems may wish to ensure that the aggregate EPFD produced by all operating co-frequency non-GSO FSS systems in the frequency bands referred to in *considering* a) above into GSO FSS and/or GSO BSS networks does not exceed the aggregate interference levels given in Annex 1,

resolves

- 1 that administrations operating or planning to operate non-GSO FSS systems in the frequency bands referred to in *considering* a) above, individually or in collaboration, take all possible steps, including by means of appropriate modifications to their systems if necessary, to ensure that the actual aggregate interference into GSO FSS and GSO BSS networks caused by such systems operating co-frequency in these frequency bands does not exceed the aggregate power levels shown in Annex 1;
- 2 that, in the event that the aggregate interference levels in Annex 1 are exceeded into an operational GSO earth station, administrations operating non-GSO FSS systems in these frequency bands shall expeditiously take all necessary measures to reduce the aggregate EPFD levels to those in Annex 1 or to reduce such interference to higher levels that are acceptable to the affected GSO administration,

requests ITU-R

1 to develop, as a matter of urgency, and complete, in time for consideration by the next WRC, a methodology for calculating the aggregate EPFD produced by all non-GSO FSS systems operating or planning to operate co-frequency in the frequency bands referred to in *considering* a) above into GSO FSS and GSO BSS networks and for comparing the calculated levels with the aggregate power levels shown in Annex 1;

2 to continue its studies on the accurate modelling of interference from non-GSO FSS systems into GSO FSS and GSO BSS networks in the frequency bands referred to in *considering* a) above in order to assist the administrations planning or operating non-GSO FSS systems in their efforts to limit the aggregate EPFD levels produced by their systems into GSO networks,

requests the Director of the Radiocommunication Bureau

to assist in the development of the methodology referred to in *requests ITU-R* 1 above.

Reasons: The ITU-R has determined that it is necessary to provide a regulatory mechanism that ensures the protection of GSO FSS and GSO BSS networks from the maximum aggregate equivalent power flux-density produced by multiple non-GSO FSS systems in frequency bands where EPFD limits have been adopted. The foregoing Resolution, which is in the form of the example resolution suggested by CPM-99-2, is the only such regulatory mechanism other than inclusion of the aggregate EPFD limits in Article **S22** that would provide the necessary protection of GSO FSS and GSO BSS networks.

USA/1.13 / 120
ADD

ANNEX 1 (TO RESOLUTION WWW)

This Annex to Resolution **WWW** contains tables of interference levels concerning aggregate interference from multiple non-GSO FSS systems into GSO FSS and GSO BSS systems.

TABLE 1A-FSS ¹

Limits to the aggregate EPFD_{down} radiated by non-GSO FSS systems in certain frequency bands

Frequency band (GHz)	EPFD _{down} dB(W/m ²)	Percentage of time during which EPFD _{down} may not be exceeded	Reference bandwidth (kHz)	Reference antenna diameter, and reference radiation pattern ²
10.7 – 11.7; 11.7 – 12.2 in Region 2; 12.2 – 12.5 in Region 3 and 12.5 – 12.75 in Regions 1 and 3	-170.0	0	40	60 cm Rec. S.[4/57]
	-168.6	90		
	-165.3	99		
	-160.4	99.97		
	-160.0	99.99		
	-160.0	100		
	-176.5	0	40	1.2 m Rec. S.[4/57]
	-173.0	99.5		
	-164.0	99.84		
	-161.6	99.945		
	-161.4	99.97		
	-160.8	99.99		
	-160.5	99.99		
	-160	99.9975		
	-160	100		
	[---]	[---]	40	3 m Rec. S.[4/57]
	[---]	[---]		
	[---]	[---]		
	[---]	[---]		
	[---]	[---]		
	[---]	[---]	40	10 m Rec. S.[4/57]
	[---]	[---]		
	[---]	[---]		
	[---]	[---]		

¹ For certain receive earth stations, see also ADD **S9.7A** and ADD **S9.7B**.

² Under this Section, reference patterns are to be used only for the calculation of interference from non-GSO FSS systems into GSO FSS and BSS systems.

TABLE 1B-FSS¹

Limits to the aggregate EPFD_{down} radiated by non-GSO FSS systems in certain frequency bands

Frequency Band (GHz)	Epfd_{down} dB(W/m²)	Percentage of time during which Epfd_{down} may not be exceeded	Reference Bandwidth (kHz)	Reference antenna diameter, and reference radiation pattern²
17.8-18.6	-170 -170 -164 -164	0 90 99.9 100	40 ³	1 m Rec. S.[4/57]
17.8-18.6	-173 -173 -166 -164 -164	0 99.4 99.9 99.92 100	40 ³	2 m Rec. S.[4/57]
17.8-18.6	-180 -180 -172 -164 -164	0 99.8 99.8 99.992 100	40 ³	5 m Rec. S.[4/57]

¹ For certain receive earth stations, see also **ADD S9.7A** and **ADD S9.7B**.

² Under this Section, reference patterns are to be used only for the calculation of interference from non-GSO FSS systems into GSO FSS and BSS systems.

³ For non-GSO emission bandwidths greater than 40 kHz, the epfd_{down} limits may be scaled by adding 10 log(non-GSO emission bandwidth / 40 kHz) in a reference bandwidth equal to the emission bandwidth.

TABLE 1C-FSS¹
Limits to the aggregate EPFD_{down} radiated by non-GSO FSS systems in certain frequency bands

Frequency Band (GHz)	Epfd _{down} dB(W/m ²)	Percentage of time during which Epfd _{down} may not be exceeded	Reference Bandwidth (kHz)	Reference antenna diameter, and reference radiation pattern ²
19.7-20.2	-182 -172 -154 -154	0 90 99.94 100	40 ³	70 cm Rec. S.[4/57]
19.7-20.2	-185 -176 -165 -160 -154 -154	0 91 99.8 99.8 99.99 100	40 ³	90 cm Rec. S.[4/57]
19.7-20.2	-193 -185 -166 -160 -154 -154	0 90 99.99 99.99 99.998 100	40 ³	2.5 m Rec. S.[4/57]

¹ For certain receive earth stations, see also **ADD S9.7A** and **ADD S9.7B**.

² Under this Section, reference patterns are to be used only for the calculation of interference from non-GSO FSS systems into GSO FSS and BSS systems.

³ For non-GSO emission bandwidths greater than 40kHz, the epfd_{down} limits may be scaled by adding 10 log(non-GSO emission bandwidth / 40 kHz) in a reference bandwidth equal to the emission bandwidth.

TABLE 1D-BSS**Limits to the aggregate EPFD_{down} radiated by non-GSO FSS systems in certain frequency bands****30cm, 45cm, and 60cm BSS antennas**

Frequency band (GHz)	Epfd_{down} dB(W/m²)	Percentage of time during which Epfd_{down} may not be exceeded	Reference bandwidth (kHz)	Reference antenna diameter, and reference radiation pattern ¹
11.7 – 12.5 GHz In Region 1 11.7 – 12.2 GHz and 12.5 – 12.75 GHz In Region 3 12.2 – 12.7 GHz In Region 2	-160.400 -160.100 -158.600 -158.600 -158.330 -158.330	0.000 25.000 96.000 98.000 98.000 100.000	40	30 cm DNR ITU-R BO. [Doc. 11/137 Annex 1]
11.7 – 12.5 In Region 1 11.7 – 12.2 and 12.5 – 12.75 GHz In Region 3 12.2 – 12.7 In Region 2	-170.000 -167.000 -164.000 -160.750 -160.750 -160.000 -159.900	0.000 66.000 97.750 99.330 99.330 99.950 100.000	40	45 cm DNR ITU-R BO. [Doc. 11/137 Annex 1]
11.7 – 12.5 In Region 1 11.7 – 12.2 and 12.5 – 12.75 In Region 3 12.2 – 12.7 In Region 2	-171.000 -168.750 -167.750 -162.000 -161.000 -160.200 -160.000 -159.900	0.000 90.000 97.800 99.600 99.800 99.900 99.990 100.000	40	60 cm DNR ITU-R BO. [Doc. 11/137 Annex 1]

¹ Under this Section, reference patterns are to be used only for the calculation of interference from non-GSO FSS systems into GSO FSS and BSS systems.

TABLE 1E-BSS

Limits to the aggregate EPFD_{down} radiated by non-GSO FSS systems in certain frequency bands
90cm and 120cm BSS antennas

Frequency band (GHz)	Epfd_{down} dB(W/m²)	Percentage of time during which Epfd_{down} may not be exceeded	Reference bandwidth (kHz)	Reference antenna diameter, and reference radiation pattern ¹
11.7 – 12.5 In Region 1 11.7 – 12.2 and 12.5 – 12.75 In Region 3 12.2 – 12.7 In Region 2	-173.75 -173 -171 -165.5 -163 -161 -160 -159.9	0.000 33.000 98.000 99.100 99.500 99.800 99.970 100.000	40	90 cm DNR ITU-R BO. [Doc. 11/137 Annex 1]
11.7 – 12.5 In Region 1 11.7 – 12.2 and 12.5 – 12.75 In Region 3 12.2 – 12.7 In Region 2	-177.000 -175.250 -173.750 -173.000 -169.500 -167.800 -164.000 -161.900 -161.000 -160.400 -159.900	0.000 90.000 98.900 98.900 99.500 99.700 99.820 99.900 99.965 99.993 100	40	120 cm DNR ITU-R BO. [Doc. 11/137 Annex 1]

¹ Under this Section, reference patterns are to be used only for the calculation of interference from non-GSO FSS systems into GSO FSS and BSS systems.

TABLE 1F-BSS

Limits to the aggregate EPFD_{down} radiated by non-GSO FSS systems in certain frequency bands at latitudes #57.5E

180cm and 240cm BSS antennas

Frequency band (GHz)	Epfd_{down}¹ dB(W/m²)	Percentage of time during which Epfd_{down} may not be exceeded	Reference bandwidth (kHz)	Reference antenna diameter, and reference radiation pattern²
12.2 – 12.7 In Region 2	-179.500	0.000	40	180 cm DNR ITU-R BO. [Doc. 11/137 Annex 1]
	-178.660	33.000		
	-176.250	98.500		
	-163.250	99.810		
	-161.500	99.910		
	-160.350	99.975		
	-160.000	99.995		
12.2 – 12.7 In Region 2	-159.900	100.00	40	240 cm DNR ITU-R BO. [Doc. 11/137 Annex 1]
	-182.000	0.000		
	-180.900	33.000		
	-178.000	99.250		
	-164.400	99.850		
	-161.900	99.940		
	-160.500	99.980		
	-160.000	99.995		
	-159.900	100.00		

¹ In Region 2 west of 150° West Longitude, -163 dBW/m²/40 kHz may not be exceeded for 100% of the time.

² Under this Section, reference patterns are to be used only for the calculation of interference from non-GSO FSS systems into GSO FSS and BSS systems.

Reasons: The ITU-R has determined that it is necessary to provide a regulatory mechanism that ensures the protection of GSO FSS and GSO BSS networks from the maximum aggregate equivalent power flux-density produced by multiple non-GSO FSS systems in frequency bands where EPFD limits have been adopted. Tables 1A-1F specify the maximum aggregate equivalent power flux-density produced by multiple non-GSO FSS systems in order to protect GSO FSS and GSO BSS systems. This Resolution is the only such regulatory mechanism other than inclusion of the aggregate EPFD limits in Article S22 that would provide the necessary protection of GSO FSS and GSO BSS networks.

TABLE 1G-BSS

Limits to the 100% to the time aggregate EPFD_{down} value varying with latitude for BSS earth station antennas larger than 120 cm

100% of the time EPFD_{down} dB(W/m²/40kHz)	Latitude, North or South, degrees
-160	0 # Latitude #57.5
-160 + 15*(57.5-Latitude)/7	57.5 # Latitude #61
-167.5	61 # Latitude

Proposals for modifications to Article S22 in relation to the sharing conditions among non-GSO FSS, FSS and GSO BSS services (13 September 99)

Background Information: Resolution **130 (WRC-97)** and Resolution **538 (WRC-97)** each requested the ITU-R to conduct (a) “appropriate technical, operational and regulatory studies” to review the regulatory conditions relating to the coexistence of non-GSO FSS and GSO FSS and GSO BSS systems, in order to ensure that undue constraints are not placed on the development of non-GSO FSS, GSO FSS and GSO BSS systems, and (b) the development of a methodology for calculating the power levels produced by non-GSO FSS systems and the compliance of these levels with the applicable limits established pursuant to Resolutions **130** and **538**.

Joint Task Group 4-9-11 was established by the ITU-R to pursue these mandates and to determine the necessary technical bases. Taking into account the work of the ITU-R on this matter, the United States makes the following proposals for **Section II** of Article **S22**.

Proposals:

ARTICLE S22

Section II – Control of interference to geostationary-satellite systems

USA/1.13.1/ 121 **S22.2** § 2 1)
NOC

USA/1.13.1/ 122 **S22.3** 2)
NOC

USA/1.13.1/ 123 **S22.4** § 3
NOC

USA/1.13.1/ 124 **S22.5** § 4
NOC

USA/1.13.1/ 125 **S22.5A** § 5
NOC

USA/1.13.1/ 126 **S22.5B**
SUP

USA/1.13.1/ 127 **S22.5B** § 5 1) The equivalent power flux-density^{xx}, EPFD_{down}, at any point on the Earth's surface visible from the geostationary-satellite orbit, produced by emissions from all the space stations of a non-geostationary-satellite system in the fixed-satellite service in the frequency bands listed in Tables **S22-1A** through **S22-1F**, including emissions from a reflecting satellite, for all conditions and for all methods of modulation, shall not exceed the limits given in Tables **S22-1A**
ADD

through **S22-1F** for the given percentages of time. These limits relate to the equivalent power flux-density which would be obtained under free-space propagation conditions, into a reference antenna and in the reference bandwidth specified in Tables **S22-1A** through **S22-1F**, for all pointing directions towards the geostationary-satellite orbit.

**USA/1.13.1/ 128
SUP**

S22.5C1

**USA/1.13.1/ 129
SUP**

S22.5D1

**USA/1.13.1/ 130
SUP**

S22.5F1

**USA/1.13.1/ 131
ADD**

^{xx} **S22.5B.1** The equivalent power flux-density is defined as the sum of the power flux-densities produced at a GSO receive station on the Earth's surface or in the geostationary orbit, as appropriate, by all the transmit stations within a non-geostationary-satellite system, taking into account the off-axis discrimination of a reference receiving antenna assumed to be pointing in its nominal direction. The equivalent power flux-density is calculated using the following formula:

$$EPFD = 10 \cdot \log_{10} \left[\sum_{i=1}^{N_a} 10^{\frac{P_i}{10}} \cdot \frac{G_t(q_i)}{4 \cdot p \cdot d_i^2} \cdot \frac{G_r(f_i)}{G_{r, \max}} \right]$$

where:

- N_a is the number of transmit stations in the non-geostationary satellite system that are visible from the GSO receive station considered on the Earth's surface or in the geostationary orbit, as appropriate
- i is the index of the transmit station considered in the on geostationary-satellite system
- P_i is the RF power at the input of the antenna of the transmit station, considered in the non-geostationary satellite system in dBW in the reference bandwidth
- q_i is the off-axis angle between the boresight of the transmit station considered in the non-geostationary satellite system and the direction of the GSO receive station
- $G_t(q_i)$ is the transmit antenna gain (as a ratio) of the station considered in the non-geostationary satellite system in the direction of the GSO receive station

- d_i is the distance in metres between the transmit station considered in the non-geostationary satellite system and the GSO receive station
- f_i is the off-axis angle between the boresight of the antenna of the GSO receive station and the direction of the i th transmit station considered in the non-geostationary satellite system
- $G_r(f_i)$ is the receive antenna gain (as a ratio) of the GSO receive station in the direction of the i th transmit station considered in the non-geostationary satellite system
- $G_{r,max}$ is the maximum gain (as a ratio) of the antenna of the GSO receive station
- $EPFD$ is the computed equivalent power flux-density in $\text{dB(W/m}^2\text{)}$ in the reference bandwidth

USA/1.13.1/ 132
ADD

TABLE S22-1A¹

Limits to the EPFD_{down} radiated by non-GSO FSS systems in certain frequency bands

Frequency band (GHz)	EPFD _{down} dB(W/m ²)	Percentage of time during which EPFD _{down} may not be exceeded	Reference bandwidth (kHz)	Reference antenna diameter, and reference radiation pattern ²
10.7 - 11.7; 11.7 - 12.2 in Region 2; 12.2 - 12.5 in Region 3 and 12.5 - 12.75 in Regions 1 and 3	-175.4	0	40	60 cm Rec. S.4/57
	-174.0	90		
	-170.8	99		
	-165.3	99.73		
	-160.4	99.991		
	-160.0	99.997		
	-160.0	100		
	-181.9	0	40	1.2 m Rec. S. 4/57
	-178.4	99.5		
	-173.4	99.74		
	-173.0	99.857		
	-164.0	99.954		
	-161.6	99.984		
	-161.4	99.991		
	-160.8	99.997		
	-160.5	99.997	40	3 m Rec. S. 4/57
	-160.0	99.9993		
	-160.0	100		
	-182	99.9		
	-176	99.97	40	10 m Rec. S. 4/57
	-163	99.999		
	-160	100	40	10 m Rec. S. 4/57
	-185	99.97		
	-168	99.999		

¹ For certain receive earth stations, see also **ADD S9.7A** and **ADD S9.7B**.

² Under this Section, reference patterns are to be used only for the calculation of interference from non-GSO FSS systems into GSO FSS and BSS systems.

USA/1.13.1/ 133
ADD

TABLE S22-1B¹
Limits to the EPFD_{down} radiated by non-GSO FSS systems in certain frequency bands

Frequency Band (GHz)	EPFD _{down} dB(W/m ²)	Percentage of time during which EPFD _{down} may not be exceeded	Reference Bandwidth (kHz)	Reference antenna diameter, and reference pattern ²
17.8-18.6	-175.4	0	40 ³	1 m Rec. S.[4/57]
	-175.4	90		
	-172.5	99		
	-167	99.714		
	-164	99.971		
	-164	100		
17.8-18.6	-178.4	0	40 ³	2 m Rec. S.[4/57]
	-178.4	99.4		
	-171.4	99.9		
	-170.5	99.913		
	-166	99.971		
	-164	99.977		
17.8-18.6	-164	100		
	-185.4	0	40 ³	5 m Rec. S.[4/57]
	-185.4	99.8		
	-180	99.8		
	-180	99.943		
	-172	99.943		
	-164	99.998		
	-164	100		

1. For certain receive earth stations, see also **ADD S9.7A** and **ADD S9.7B**.
2. Under this Section, reference patterns are to be used only for the calculation of interference from non-GSO FSS systems into GSO FSS and BSS systems.
3. For non-GSO emission bandwidths greater than 40 kHz, the EPFD_{down} limits may be scaled by adding $10 \log(\text{non-GSO emission bandwidth} / 40 \text{ kHz})$ in a reference bandwidth equal to the emission bandwidth.

USA/1.13.1/ 134
ADD

TABLE S22-1C¹
Limits to the EPFD_{down} radiated by non-GSO FSS systems in certain frequency bands

Frequency Band (GHz)	EPFD _{down} dB(W/m ²)	Percentage of time during which EPFD _{down} may not be exceeded	Reference Bandwidth (kHz)	Reference antenna diameter, and reference pattern
19.7-20.2	-187.4	0	40 ³	70 cm Rec. S.[4/57]
	-182	71.429		
	-172	97.143		
	-154	99.983		
	-154	100		
19.7-20.2	-190.4	0	40 ³	90 cm Rec. S.[4/57]
	-181.4	91		
	-170.4	99.8		
	-168.6	99.8		
	-165	99.943		
	-160	99.943		
	-154	99.997		
	-154	100		
19.7-20.2	-198.4	0	40 ³	2.5 m Rec. S.[4/57]
	-190.4	90		
	-171.4	99.99		
	-169.4	99.99		
	-166	99.99714		
	-160	99.99714		
	-154	99.99943		
	-154	100		

¹ For certain receive earth stations, see also **ADD S9.7A** and **ADD S9.7B**.

² Under this Section, reference patterns are to be used only for the calculation of interference from non-GSO FSS systems into GSO FSS and BSS systems.

³ For non-GSO emission bandwidths greater than 40 kHz, the EPFD_{down} limits may be scaled by adding 10 log(non-GSO emission bandwidth / 40 kHz) in a reference bandwidth equal to the emission bandwidth.

USA/1.13.1/ 135
ADD

TABLE S22-1D

Limits to the EPFD_{down} radiated by non-GSO FSS systems in certain frequency bands
30cm, 45cm and 60cm BSS antennas

Frequency band (GHz)	EPFD _{down} dB(W/m ²) ¹	Percentage of time during which EPFD _{down} may not be exceeded	Reference bandwidth (kHz)	Reference antenna diameter, and reference radiation pattern ²
11.7 – 12.5 In Region 1 11.7 – 12.2 and 12.5 – 12.75 In Region 3 12.2 – 12.7 In Region 2	-165.841 -165.541 -164.041 -158.600 -158.600 -158.330 -158.330	0.000 25.000 96.000 98.857 99.429 99.429 100.000	40	30 cm DNR ITU-R BO. [Doc. 11/137 Annex 1]
11.7 – 12.5 In Region 1 11.7 – 12.2 and 12.5 – 12.75 In Region 3 12.2 – 12.7 In Region 2	-175.441 -172.441 -169.441 -164.000 -160.750 -160.000 -159.900	0.000 66.000 97.750 99.357 99.809 99.986 100.000	40	45 cm DNR ITU-R BO. [Doc. 11/137 Annex 1]
11.7 – 12.5 In Region 1 11.7 – 12.2 and 12.5 – 12.75 In Region 3 12.2 – 12.7 In Region 2	-176.441 -173.191 -167.750 -162.000 -161.000 -160.200 -160.000 -159.900	0.000 97.800 99.371 99.886 99.943 99.971 99.997 100.000	40	60 cm DNR ITU-R BO. [Doc. 11/137 Annex 1]

¹ For checking compliance with these limits, the BR software will use increments of 0.1 dB and will test against the fractionally more severe value: for example where the EPFD_{down} limit is -165.841 dB(W/m²/40 kHz) the software will test against a criterion of -165.9 dB(W/m²/40 kHz).

- 2 Under this Section, reference patterns are to be used only for the calculation of interference from non-GSO FSS systems into GSO FSS and BSS systems.

TABLE S22-1E

USA/1.13.1/ 136

ADD

Limits to the EPFD_{down} radiated by non-GSO FSS systems in certain frequency bands 90cm and 120cm BSS antennas

Frequency band (GHz)	EPFD _{down} dB(W/m ²) ¹	Percentage of time during which EPFD _{down} may not be exceeded	Reference bandwidth (kHz)	Reference antenna diameter, and reference radiation pattern ²
11.7 – 12.5 In Region 1 11.7 – 12.2 and 12.5 – 12.75 In Region 3 12.2 – 12.7 In Region 2	-178.94 -178.44 -176.44 -171.00 -165.50 -163.00 -161.00 -160.00 -159.90	0.000 33.000 98.000 99.429 99.714 99.857 99.943 99.991 100.000	40	90 cm DNR ITU-R BO. [Doc. 11/137 Annex 1]
11.7 – 12.5 In Region 1 11.7 – 12.2 and 12.5 – 12.75 In Region 3 12.2 – 12.7 In Region 2	-182.440 -180.690 -179.190 -178.440 -174.940 -173.750 -173.000 -169.500 -167.800 -164.000 -161.900 -161.000 -160.400 -159.900	0.000 90.000 98.900 98.900 99.500 99.680 99.680 99.850 99.915 99.940 99.970 99.990 99.998 100	40	120 cm DNR ITU-R BO. [Doc. 11/137 Annex 1]

¹ For checking compliance with these limits, the BR software will use increments of 0.1 dB and will test against the fractionally more severe value: for example where the EPFD_{down} limit is -165.841 dB(W/m²/40 kHz) the software will test against a criterion of -165.9 dB(W/m²/40 kHz).

² Under this Section, reference patterns are to be used only for the calculation of interference from non-GSO FSS systems into GSO FSS and BSS systems.

USA/1.13.1/ 137
ADD

TABLE S22-1F

Limits to the aggregate EPFD_{down} radiated by non-GSO FSS systems at latitudes #57.5E in certain frequency bands at latitudes

180cm and 240cm BSS antennas

Frequency band (GHz)	Epfd _{down} ^{1,2} dB(W/m ²)	Percentage of time during which Epfd _{down} may not be exceeded	Reference bandwidth (kHz)	Reference antenna diameter, and reference radiation pattern ³
12.2 – 12.7 In Region 2	-184.941 -184.101 -181.691 -176.250 -163.250 -161.500 -160.350 -160.000 -159.900	0.000 33.000 98.500 99.571 99.946 99.974 99.993 99.999 100.000	40	180 cm DNR ITU-R BO. [Doc. 11/137 Annex 1]
12.2 – 12.7 In Region 2	-187.441 -186.341 -183.441 -178.000 -164.400 -161.900 -160.500 -160.000 -159.900	0.000 33.000 99.250 99.786 99.957 99.983 99.994 99.999 100.000	40	240 cm DNR ITU-R BO. [Doc. 11/137 Annex 1]

1 In Region 2 west of 150° West Longitude, -163 dBW/m²/40 kHz may not be exceeded for 100% of the time.

2 For checking compliance with these limits, the BR software will use increments of 0.1 dB and will test against the fractionally more severe value: for example where the EPFD_{down} limit is -165.841 dB(W/m²/40 kHz) the software will test against a criterion of -165.9 dB(W/m²/40 kHz).

3 Under this Section, reference patterns are to be used only for the calculation of interference from non-GSO FSS systems into GSO FSS and BSS systems.

TABLE S22-1G

100% of the time single-entry EPFD_{down} value varying with latitude for BSS earth station antennas larger than 120 cm

100% of the time EPFD_{down} dB(W/m²/40kHz)	Latitude, North or South, degrees
-160	0 # LATITUDE #57.5
$-160 + 15 \cdot (57.5 - \text{LATITUDE}) / 7$	57.5 # LATITUDE #61
-167.5	61 # LATITUDE

USA/1.13.1/ 138 S22.5C
SUP

USA/1.13.1/ 139 S22.5C 2) The equivalent power flux-density^{XX}, EPFD_{up}, produced at any point in the geostationary-satellite orbit by emissions from all the earth stations in a non-geostationary-satellite system in the fixed-satellite service in the frequency bands listed in Table S22-2, for all conditions and for all methods of modulation, shall not exceed the limits given in Table S22-2 for the specified percentages of time. These limits relate to the equivalent power flux-density which would be obtained under free-space propagation conditions, into a reference antenna and in the reference bandwidth specified in Table S22-2, for all pointing directions towards the Earth's surface visible from the geostationary-satellite orbit.

USA/1.13.1/ 140
ADD

TABLE S22-2

Limits to the EPFD_{up} radiated by non-GSO FSS systems in certain frequency bands

Frequency band (GHz)	EPFD _{up} dB(W/m ²)	Percentage of time during which EPFD _{up} may not be exceeded	Reference bandwidth (kHz)	Reference antenna beamwidth and reference radiation pattern ²
12.50 - 12.75 12.75 - 13.25 13.75 - 14.5	-160	100	40	4 degrees ITU-R S.672, Ls = -20 ¹
17.3-17.8 Region 1 and Region 3 ³ 17.8-18.1	-160	100	40	4 degrees ITU-R S.672, Ls = -20 ¹
27.5 – 28.6	-162	100	40	1.55 degrees ITU-R S.672, Ls = -10 ¹
29.5 – 30.0	-162	100	40	1.55 degrees ITU-R S.672, Ls = -10 ¹
¹ For the case of Ls=-10, the values a=1.83 and b=6.32 should be used in the equations in Annex 1 of Recommendation ITU-R S.672 for single-feed circular beams. In all cases of Ls, the parabolic main beam equation should start at zero. ² Under this Section, this reference pattern is to be used only for the calculation of interference from non-GSO FSS systems into GSO FSS systems. ³ Although the 17.3-17.8 GHz band is not allocated to non-GSO FSS in Region 2, this EPFD _{up} level also applies to the frequency band 17.3-17.8 GHz to protect BSS feeder links in Region 2 from non-GSO FSS Earth-to-space transmissions in Regions 1 and 3.				

USA/1.13.1/ 141
ADD

S22.5D 3) The equivalent power flux-density^{xx}, EPFD_{is}, produced at any point in the geostationary-satellite orbit by emissions from all the space stations in a non-geostationary-satellite system in the fixed-satellite service in the frequency bands listed in Table S22-3, including emissions from a reflecting satellite, for all conditions and for all methods of modulation, shall not exceed the limits given in Table S22-3 for the specified percentages of time. These limits relate to the equivalent power flux-density which would be obtained under free-space propagation conditions into a reference antenna and in the reference bandwidth specified in Table S22-3, for all pointing directions towards the Earth's surface visible from the geostationary-satellite orbit.

USA/1.13.1/ 142
ADD

TABLE S22-3

Limits to the EPFD_{is} radiated by non-GSO FSS systems in certain frequency bands

Frequency band (GHz)	EPFD _{is} dB(W/m ²)	Percentage of time during which EPFD _{is} may not be exceeded	Reference bandwidth (kHz)	Reference antenna beamwidth and reference radiation pattern ¹
10.7 – 11.7 (Region 1) 12.5 – 12.75 (Region 1) 12.7 – 12.75 (Region 2)	-160	100	40	4 degrees ITU-R S.672, L _s = -20
17.8 – 18.4	-160	100	40	4 degrees ITU-R S.672, L _s = -20

¹ Under this Section, this reference pattern is to be used only for the calculation of interference from non-GSO FSS systems into GSO FSS systems.

USA/1.13.1/ 143
SUP

S22.5E

USA/1.13.1/ 144
ADD

S22.5E The limits given in Tables **S22-1A** through **S22-1F** may be exceeded on the territory of any country whose Administration has so agreed.

USA/1.13.1/ 145
SUP

S22.5F

USA/1.13.1/ 146
ADD

S22.5F The limits specified in No **S22.5B** to **S22.5D** apply to non-GSO FSS systems for which complete coordination or notification information has been received after 22 November 1997.

USA/1.13.1/ 147
SUP

S22.5G

USA/1.13.1/ 148
ADD

S22.5G An administration operating a non-GSO FSS system which is in compliance with the limits in No. **S22.5B** to **S22.5D** (see also Resolution **WWW**) shall be considered as having fulfilled its obligations under No. **S22.2** with respect to any GSO network, irrespective of the dates of receipt by the Bureau of the complete notification information for the non-GSO system and of the complete coordination information for the GSO network, provided that the EPFD_{down} radiated by the non-GSO FSS system into any operating GSO FSS earth station does not exceed the operational limits given in Table **S22-4**, when the gain of this earth station is equal to or greater than the corresponding value given in Table **S22-4** for the corresponding orbital inclination of the GSO FSS satellite as given in Table **S22-4**. An administration operating a non-GSO FSS system that is

subject to the limits in **No. S22.5B** to **S22.5D** and which radiates EPFD_{down} at levels in excess of the limits in **No. S22.5B** to **S22.5D**, or which radiates EPFD_{down} into any operating GSO FSS earth station at levels in excess of the operational limits given in Table **S22-4**, when the gain of this earth station is equal to or greater than the corresponding value given in Table **S22-4** for the corresponding orbital inclination of the GSO FSS satellite as given in Table **S22-4**, shall be considered to be in violation of its obligations under **No. S22.2**.

USA/1.13.1/ 149
ADD

TABLE S22-4 ³

Operational Limits to the EPFD_{down} radiated by non-GSO FSS systems in certain frequency bands

Frequency Band (GHz)	EPFD _{down} dB(W/m ²)	Percentage of time during which EPFD _{down} may not be exceeded	Reference Bandwidth (kHz)	Receive GSO earth station antenna Gain (dBi)	Orbital inclination of GSO satellite
10.7 - 12.75	-163	100	40	≥59	≤2.5°
	TBD	100	40	≥59	≤4.5°
	[-160]	100	40	≥59	≤2.5° and ≤4.5°
19.7 - 20.2	-157	100	40 ²	≥55	≤2.5
	-157	100	40 ²	≥43 ¹	≤2.5

1. The operational limit applies only to non-GSO systems operating at altitudes of 7000 km or above in order to protect GSO FSS systems employing adaptive coding.
2. For non-GSO emission bandwidths greater than 40 kHz, the EPFD_{down} limits may be scaled by adding 10log(non-GSO emission bandwidth/40 kHz) in a reference bandwidth equal to the emission bandwidth.
3. For certain receive earth station, see also **ADD S9.7A** and **ADD S9.7B**.

USA/1.13.1/ 150
ADD

S22.5H In case of *force majeure*, telecommand and ranging carriers transmitted to non-geostationary satellites in the fixed-satellite service are not subject to the limits given in Table **S22-2**.

Reasons: Proposed Sections **ADD S22.5B**, **ADD S22.5C**, **ADD S22.5D**, **ADD S22.5E**, **ADD S22.5F**, **ADD S22.5G**, and **ADD S22.5H**, which are based in substantial part on work that has been performed in the ITU-R since WRC-97 established current **Nos. S22.5B**, **S22.5C**, **S22.5D**, **S22.5E**, and **S22.5F** are intended to be a package that would replace and supplement the current provisions of much of Section II of Article **S22**.

Proposals for Agenda Item 1.15.1

to consider new allocations to the radionavigation-satellite service in the range from 1 to 6 GHz
required to support developments

Proposal for additional Radionavigation-Satellite Service (RNSS) signals (23July99)

Background Information: Additional Radionavigation-Satellite Service (RNSS) signals will greatly enhance the accuracy, reliability and robustness of the civil Global Positioning System (GPS) by enabling more effective corrections to be made for the time delay effects of the ionosphere on the signals from space. The International Civil Aviation Organization (ICAO) has stated the requirement for an additional civil signal on GPS to support Global Navigation Satellite System (GNSS) requirements and for space-based augmentation systems. A requirement for aeronautical users is having the protected signal operate within radio spectrum allocated to the Aeronautical Radionavigation Service (ARNS), which would also include the possibility of terrestrial augmentation systems.

The United States has identified a third signal at 1 176.45 MHz to support GNSS developments. The third signal is proposed to be an international civil aviation safety-of-life service signal with a required bandwidth 24 MHz. Technical studies show compatibility between existing operational ARNS systems and the proposed new signal at 1 176.45 MHz. The power levels and signal structure will allow the operation of a relatively large number of co-frequency satellite and terrestrial stations to be in view of an RNSS receiver.

Proposal:

Section IV – Table of Frequency Allocations

960-1 215 MHz

Allocation to services		
Region 1	Region 2	Region 3
960-1 215	AERONAUTICAL RADIONAVIGATION MOD S5.328	

USA/1.15.1/ 151
MOD

S5.328 The band 960 - 1 215 MHz is reserved on a worldwide basis for the use and development of airborne electronic aids to air navigation and any directly associated ground-based and satellite-borne facilities. In the 1 164 - 1 188 MHz portion of this band, the radionavigation-satellite service (space-to-Earth) is also allocated worldwide on a primary basis. In this band stations of the radionavigation-satellite services, but not in the aeronautical radionavigation-satellite service, shall not cause harmful interference to, or claim protection from, stations of the aeronautical radionavigation and aeronautical radionavigation-satellite services.

Reasons: Additional Radionavigation-Satellite Service (RNSS) signals will greatly enhance the accuracy, reliability and robustness of the civil Global Navigation Satellite System (GNSS) by enabling more effective corrections to be made for the time delay effects of the ionosphere on the signals from space.

Proposals for Agenda Item 1.15.2

to consider the addition of the space-to-space direction to the radionavigation-satellite service allocations in the bands 1 215 - 1 260 and 1 559 - 1 610 MHz

Proposal for an allocation for space-to-space use for RNSS to ensure the protection of space-based RNSS receivers. (23July99)

Background: Radionavigation-Satellite Service (RNSS) systems such as the Global Positioning System and Global Navigation Satellite System are primarily being used in the space-to-Earth direction to provide service to terrestrial users. These systems are, however, also increasingly being used in the space-to-space direction by spaceborne users for such applications as spacecraft three-dimensional positioning and velocity determination; three-axis attitude control; precise time synchronization; precision orbit determination, and atmospheric science. The use of RNSS signals is presently protected only through a space-to-Earth allocation in the 1 215 - 1 260 and 1 559 -

1 610 MHz bands. Recognizing current and future operational usage of spaceborne RNSS receivers for scientific and commercial applications, it is important to add the space-to-space direction to the existing RNSS allocations so that these uses can be taken into consideration when changes to the use of these bands are contemplated.

Interference studies have been conducted to assess the sensitivity of spaceborne RNSS receivers to interference from radiolocation, Earth exploration-satellite (active), space research (active), fixed, mobile and aeronautical radionavigation services in the 1 215 - 1 260 MHz band; from the aeronautical radionavigation and fixed services in the 1 559 - 1 610 MHz band; and also their sensitivity to intra-service interference between radionavigation satellite service systems in these two bands.

The ITU-R has concluded that the addition of a space-to-space direction to the 1 215 - 1 260 MHz and 1 559 - 1 610 MHz RNSS bands will not cause any additional interference to other services since it involves no change to the space-to-Earth transmissions.

Studies demonstrate that RNSS spaceborne receivers can operate satisfactorily in the presence of interference caused by systems in other services as well as other RNSS systems. Potential interference from services in adjacent bands was also examined.

Existing coordination procedures are adequate for space-to-space operations.

Proposals:

MHz
1 215 – 1 260

Allocation to Services			
Region 1	Region 2	Region 3	
USA/1.15.2/152 MOD	1 215-1 240	EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION RADIONAVIGATION-SATELLITE (space-to-Earth) <u>(space-to-space)</u> SPACE RESEARCH (active) S5.329 S5.330 S5.331 S5.332	
	1 240-1 260	EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION RADIONAVIGATION-SATELLITE (space-to-Earth) <u>(space-to-space)</u> SPACE RESEARCH (active) Amateur S5.329 S5.330 S5.331 S5.332 S5.334 S5.335	

Reasons: Provide an allocation for space-to-space use for RNSS, which will ensure the protection of space-based RNSS receivers.

MHz
1 559 – 1 610

Allocation to Services			
Region 1	Region 2	Region 3	
USA/1.15.2/154 MOD	1 559 – 1 610	AERONAUTICAL RADIONAVIGATION RADIONAVIGATION-SATELLITE (space-to-Earth) <u>(space-to-space)</u> S5.341 S5.355 S5.359 S5.363	

Reasons: Provide an allocation for space-to-space use for RNSS, which will ensure the protection of space-based RNSS receivers.

Proposals for Agenda Item 1.16

to consider allocations of frequency bands above 71 GHz to the earth-exploration satellite (passive) and radio astronomy services, taking into account Resolution 723

Proposal to modify the allocations above 71 GHz (4August99)

Background Information: The following proposals modify many of the allocation tables above 71 GHz to accommodate the requirements of the radio astronomy and earth-exploration satellite (passive) services, while giving consideration to the needs of other services. The modifications to the allocation tables maintain the aggregate amount of spectrum allocated to the displaced services (including the fixed-satellite service), provide frequency blocks 5-9 GHz wide to accommodate future wideband multimedia systems while taking into account differences in atmospheric attenuation, and provide appropriate separation between services.

Proposal:

GHz 71 – 74

USA/1.16/ 155
MOD

Allocation to Services		
Region 1	Region 2	Region 3
71 – 74	FIXED FIXED-SATELLITE (Earth-to-space) (<u>space-to-Earth</u>) MOBILE MOBILE-SATELLITE (Earth-to-space) (<u>space-to-Earth</u>) S5.149 S5.556	

Reasons: MSS and FSS uplinks and downlinks in 71-74 GHz and 81-84 GHz bands have been interchanged to avoid satellite downlinks in bands needed by RAS. Atmospheric absorption is only slightly higher in 71-74 GHz band than in 81-84 GHz band. The RAS footnotes **S5.149** and **S5.556** have been deleted in favor of allocations above 76 GHz. The reference to the 72.77-72.91 GHz band in footnotes **S5.149** and **S5.556** has been deleted.

GHz

74 – 76

Allocation to Services			
	Region 1	Region 2	Region 3
USA/1.16/ 156 MOD	74 – 75.5	<u>BROADCASTING-SATELLITE</u> FIXED FIXED-SATELLITE (Earth-to-space) <u>FIXED-SATELLITE (space-to-Earth)</u> MOBILE Space Research (space-to-Earth) <u>MOD S5.561 ADD S5.EEE</u>	
USA/1.16/ 157 MOD	75.5 – 76	AMATEUR AMATEUR-SATELLITE <u>BROADCASTING-SATELLITE</u> <u>FIXED</u> <u>FIXED-SATELLITE (space-to-Earth)</u> <u>MOBILE</u> Space Research (space-to-Earth) <u>MOD S5.561 ADD S5.EEE</u>	

Reasons: BSS, which is currently allocated to the 84-86 GHz band, has been relocated to this band to protect RAS above 76 GHz. Atmospheric absorption is only slightly higher in 74-76 GHz band than in 84-86 GHz band. Amateur and Amateur-Satellite allocations have been shifted to 80.5-81 GHz. The new footnote **S5.EEE** protects existing Amateur and Amateur-Satellite operations in the 75.5-76 GHz band until the year 200[X]. The FSS (Earth-to-space) allocation has been moved to 84-86 GHz band. The proposed allocations in the 74-84 GHz range preserve a contiguous 10 GHz space research downlink (secondary), which is required for space VLBI purposes. The footnote **S5.561** has been modified to recognize the change in BSS allocation.

GHz

76 – 81

Allocation to Services			
	Region 1	Region 2	Region 3
USA/1.16/ 158 MOD	76 – 8177.5	<u>RADIO ASTRONOMY ADD S5.RAS</u> RADIOLOCATION Amateur Amateur-Satellite Space Research (space-to-Earth) S5.560 <u>MOD S5.149</u>	
USA/1.16/ 159 MOD	<u>77.5 – 78</u>	<u>AMATEUR</u> <u>AMATEUR SATELLITE</u> RADIOLOCATION Amateur Amateur-Satellite <u>Radio Astronomy</u> Space Research (space-to-Earth) S5.560 <u>MOD S5.149</u>	
USA/1.16/ 160 MOD	<u>78 – 81</u>	<u>RADIO ASTRONOMY S5.RAS</u> RADIOLOCATION Amateur Amateur-Satellite Space Research (space-to-Earth) S5.560 <u>MOD S5.149</u>	

Reasons: The existing 76 - 81 GHz band has been divided into three sub-bands. The addition of a radio astronomy allocation, footnote **S5.RAS** and **RES RAS** satisfies the requirements for radio astronomy spectral line and wide band continuum observations from remote locations world-wide in both the 76 - 77.5 GHz and 78 – 81 GHz bands. Radio astronomy is added as a secondary allocation in the 77.5 – 78 GHz band. Amateur and amateur-satellite services are shifted by 0.5 GHz, to accommodate BS, FSS and MSS downlinks at the lower portion of atmospheric window, and to avoid sharing with vehicular radars, which some Administrations have authorized to operate in the 76-77 GHz band. There is no change in sharing between services, except for introduction of RAS allocation in the upper and lower sub-bands. These bands have been added to those listed under **S5.149**. The footnote **S5.560** is deleted from the 76 - 77.5 and 77 - 78 GHz sub-bands, where it doesn't apply.

GHz

81 – 84

USA/1.16/ 161
MOD

Allocation to Services		
Region 1	Region 2	Region 3
81 – 84	<p>FIXED</p> <p>FIXED-SATELLITE (space-to-Earth)</p> <p><u>FIXED-SATELLITE (Earth-to-space)</u></p> <p>MOBILE</p> <p>MOBILE-SATELLITE (space-to-Earth)</p> <p><u>MOBILE-SATELLITE (Earth-to-space)</u></p> <p><u>RADIO ASTRONOMY ADD S5.RAS</u></p> <p>Space research (space-to-Earth)</p> <p><u>MOD S5.149 S5.DDD</u></p>	

Reasons: The directions of MSS and FSS downlinks have been reversed to allow radio astronomy observations. The uplinks are paired with the 71-74 GHz downlinks. The addition of a radio astronomy allocation, footnote **S5.RAS**, and **RES RAS** satisfies the requirements for radio astronomy spectral line and wide band continuum observations from remote locations worldwide. The footnote **S5.DDD** has been added to maintain the current amount of secondary amateur and amateur-satellite spectrum. This band has been added to footnote **S5.149**.

GHz

84 – 86

USA/1.16/ 162
MOD

Allocation to Services		
Region 1	Region 2	Region 3
84 – 86	<p>BROADCASTING</p> <p>BROADCASTING-SATELLITE</p> <p>FIXED</p> <p><u>FIXED-SATELLITE (Earth-to-space)</u></p> <p>MOBILE</p> <p><u>RADIO ASTRONOMY ADD S5.RAS</u></p> <p><u>MOD S5.149 S5.561</u></p>	

Reasons: The Broadcasting Satellite allocation has been relocated to 74-76 GHz band. The direction of satellite downlinks has been reversed to allow radio astronomy observations. The uplink has been paired with 74-76 GHz downlink. The addition of a radio astronomy allocation, footnote **S5.RAS**, and **RES RAS** satisfies the requirements for radio astronomy spectral line and wide band continuum observations from remote locations worldwide. This band has been added to footnote **S5.149**. The **S5.561** footnote is no longer relevant to this band;

appropriately modified it now applies to the 74-75.5 GHz and 75.5 - 76 GHz bands.

GHz

86 – 92

**USA/1.16/ 163
NOC**

Allocation to Services		
Region 1	Region 2	Region 3
86 – 92	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) S5.340	

Reasons: This band is of crucial importance to the RAS, SR (passive) and EES (passive) services; it is the window for the band around 118.75 GHz. No active services are acceptable in this band and no change in current allocations is feasible.

GHz

92 – 94

**USA/1.16/ 164
MOD**

Allocation to Services		
Region 1	Region 2	Region 3
92 – 94	FIXED FIXED SATELLITE (Earth to space) MOBILE <u>RADIO ASTRONOMY ADD S5.RAS</u> RADIOLOCATION MOD S5.149 -S5.556	

Reasons: The addition of a radio astronomy allocation, footnote **S5.RAS**, and **RES RAS** satisfies the requirements for radio astronomy spectral line and wide band continuum observations from remote locations world-wide. Previously, radio astronomy interest was recognised via footnote **S5.556**. The FSS (Earth-to-space) allocation, no longer needed to balance 102-105 GHz allocation, has been relocated to 71-76 GHz band. This band has been added to those listed under **S5.149**. Footnote **S5.556** has been deleted from this band, as it is no longer necessary.

GHz

94 – 94.1

**USA/1.16/ 165
MOD**

Allocation to Services		
Region 1	Region 2	Region 3
94 – 94.1	EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION SPACE RESEARCH (active) <u>Radio Astronomy</u> S5.562	

Reasons: The radio astronomy service is secondary to the active services. No change in sharing between services is proposed, except for introduction of the RAS allocation in this band.

GHz

94.1 – 95

**USA/1.16/ 166
MOD**

Allocation to Services		
Region 1	Region 2	Region 3
94.1 – 95	FIXED FIXED SATELLITE (Earth-to-space) MOBILE <u>RADIO ASTRONOMY ADD S5.RAS</u> RADIOLOCATION MOD S5.149 S5.556	

Reasons: The addition of a radio astronomy allocation, footnote **S5.RAS**, and **RES RAS** satisfies the requirements for radio astronomy spectral line and wide band continuum observations from remote locations world-wide. No change in sharing between existing services, except for introduction of RAS allocation in band. The FSS (Earth-to-space) allocation, no longer needed to balance 102-105 GHz, has been relocated to 71-76 GHz band. The footnote **S5.556** is deleted, as it is not relevant to this band (should have been suppressed consequential to WRC-97 actions). This band has been added to those listed under **S5.149**.

GHz

95 – 100

USA/1.16/ 167
MOD

Allocation to Services		
Region 1	Region 2	Region 3
95 – 100	<p><u>FIXED MOD S5.553</u></p> <p>MOBILE MOD S5.553</p> <p>MOBILE SATELLITE</p> <p><u>RADIO ASTRONOMY ADD S5.RAS</u></p> <p><u>RADIOLOCATION</u></p> <p>RADIONAVIGATION</p> <p>RADIONAVIGATION-SATELLITE</p> <p>Radiolocation</p> <p>MOD S5.149 S5.554 S5.555</p>	

Reasons: The addition of a radio astronomy allocation, footnote **S5.RAS**, and **RES RAS** satisfies the requirements for radio astronomy spectral line and wide band continuum observations from remote locations world-wide. Radiolocation has been upgraded to primary, consequential to the addition of radio astronomy as a primary service. The mobile satellite service is deleted, as it cannot share with the Radiolocation service. This band has been added to those listed under **S5.149**. Footnote **S5.555**, which allocates the 97.88-98.08 GHz sub-band to the RAS on a primary basis has been deleted, and the band has been deleted from footnote **S5.555**. The footnote **S5.553** has been modified to include stations in the fixed service.

GHz

100 – 102

USA/1.16/ 168
MOD

Allocation to Services		
Region 1	Region 2	Region 3
100 – 102	<p>EARTH EXPLORATION-SATELLITE (passive)</p> <p>FIXED</p> <p>MOBILE</p> <p><u>RADIO ASTRONOMY ADD S5.RAS</u></p> <p>SPACE RESEARCH (passive)</p> <p><u>MOD S5.149 S5.341</u></p>	

Reasons: The addition of a radio astronomy allocation, footnote **S5.RAS**, and **RES RAS** satisfies the requirements for radio astronomy spectral line and wide band continuum observations from remote locations world-wide. There is no change in sharing between services, except for introduction of RAS allocation in band. This band is used by EES (passive) for limb sounding of atmospheric constituents (NO line at 100.49 GHz). This band added to those listed under **S5.149**.

GHz

102 – 105

**USA/1.16/ 169
MOD**

Allocation to Services		
Region 1	Region 2	Region 3
102 – 105	FIXED FIXED SATELLITE (space to Earth) MOBILE RADIO ASTRONOMY ADD S5.RAS MOD S5.149 S5.341	

Reasons: The FSS allocation has been moved to 74-76 GHz band, to eliminate downlinks in the middle of the atmospheric window needed for radio astronomy observations. Atmospheric absorption in these two windows is similar. The addition of a radio astronomy allocation, footnote **S5.RAS** and **RES RAS** satisfies the requirements for radio astronomy spectral line and wide band continuum observations from remote locations world-wide. This band has been added to those listed under **S5.149**.

GHz

105 – 109.5

**USA/1.16/ 170
MOD**

Allocation to Services		
Region 1	Region 2	Region 3
105 – 116109.5	EARTH EXPLORATION SATELLITE (passive) FIXED MOBILE RADIO ASTRONOMY SPACE RESEARCH (passive) 5.CCC MOD S5.149 S5.340 S5.341	

Reasons: The 105-116 GHz range has been divided into 4 sub-bands to make additional spectrum available for other services and to adjust other passive allocations to areas of the spectrum that are more appropriate to meet scientific needs. Passive sensors have no known use for, and do not need the band 105-109.5 GHz, so they have been deleted. Fixed and mobile services have been added, relocated from 116 - 122.5 GHz band, where deletion of these services is needed to protect essential passive sensor operations. Since this band is no longer passive in nature, footnote **S5.340** should be deleted. This band is added to those included under S5.149, to reflect the need to protect radio astronomy in a band that is no longer passive. Footnote **S5.CCC** is added to limit Space Research (passive) allocation to space-based radio astronomy in this band.

GHz

109.5 – 111.8 GHz

USA/1.16/ 171
MOD

Allocation to Services		
Region 1	Region 2	Region 3
<u>109.5 – 111.8</u>	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) S5.340 S5.341	

Reason: It is essential to maintain this passive band. The **MOD** refers to the band limits only; no change **(NOC)** is proposed to the allocations within this sub-band. This band contains an ozone line at 110.8 GHz, which is used for microwave limb sounding. The entire band is of vital importance to radio astronomy for observations of the CO lines at 109.8 and 110.2 GHz, and continuum observations.

GHz

111.8 – 114.25 GHz

USA/1.16/ 172
MOD

Allocation to Services		
Region 1	Region 2	Region 3
<u>111.8 – 114.25</u>	EARTH EXPLORATION-SATELLITE (passive) <u>FIXED</u> <u>MOBILE</u> RADIO ASTRONOMY SPACE RESEARCH (passive) <u>S5.CCC</u> <u>MOD S5.149</u> S5.340 S5.341	

Reason: Passive sensors do not need the band 111.8-114.25 GHz and have been deleted. Fixed and mobile services are added to this band, they were relocated from the 116 - 122.5 GHz band where deletion of these services is needed to protect essential passive sensor operations. This band is added to those included under **S5.149** to reflect the need to protect radio astronomy in a band that is no longer passive. The addition of the new footnote **S5.CCC** limits the Space Research (passive) allocation to space-based radio astronomy in this band.

GHz

111.8 – 114.25 GHz

**USA/1.16/ 173
MOD**

Allocation to Services		
Region 1	Region 2	Region 3
<u>114.25</u> – 116	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) S5.340 S5.341	

Reason: It is essential to maintain this passive band. The **MOD** refers to the band limits only; no change (**NOC**) is proposed to the allocations within this sub-band. The band 114.25-116 GHz is of vital importance to radio astronomy for observations of the 115.3 GHz CO line and is the first portion of the 114.25-122.25 GHz oxygen absorption band which is required for remote sensing, with a peak at 118.75 GHz.

GHz

116 – 122.25

Allocation to Services			
	Region 1	Region 2	Region 3
USA/1.16/ 174 MOD	116 – 119.98	EARTH EXPLORATION-SATELLITE (passive)	
		FIXED INTER-SATELLITE <u>ADD S5.XXX</u> MOBILE – S5.558 SPACE RESEARCH (passive) S5.138 S5.341	
USA/1.16/ 175 MOD	119.98 – 120.02	EARTH EXPLORATION-SATELLITE (passive)	
		FIXED INTER-SATELLITE <u>ADD S5.XXX</u> MOBILE – S5.558 SPACE RESEARCH (passive) Amateur S5.341	
USA/1.16/ 176 MOD	120.02 – 126 <u>122.25</u>	EARTH EXPLORATION-SATELLITE (passive)	
		FIXED INTER-SATELLITE <u>ADD S5.XXX</u> MOBILE – S5.558 SPACE RESEARCH (passive) S5.138 S5.341	

Reason: This band is of crucial importance for passive sensing, as it is comprised the majority of the necessary 114.25-122.25 GHz band, the oxygen absorption band, with its peak at 118.75 GHz. The fixed and mobile services have been moved down to 105 - 109.5 GHz and 111.8-114.25 GHz, as sharing with passive sensors would severely restrict these services in this portion of the spectrum. The inter-satellite service needs to be limited by footnote **S5.XXX** to links between GSO satellites only, with pfd limits as specified in sharing studies in order to share the band 116-122.25 GHz with passive sensors. The secondary allocation to amateur services in the band 119.98-120.02 GHz is also moved to 122.5-123 GHz band to avoid interference to passive sensors.

GHz

122.25 – 123

USA/1.16/ 177
MOD

Allocation to Services		
Region 1	Region 2	Region 3
<u>122.25 – 123</u>	EARTH EXPLORATION SATELLITE (passive) FIXED INTER-SATELLITE MOBILE MOD S5.558 SPACE RESEARCH (passive) <u>Amateur</u> S5.138 S5.341	

Reason: The passive sensor allocations have been deleted from this band, as they are not needed for remote sensing applications. A secondary amateur service allocation has been added to compensate for the deletion of their allocation in the 119.98-120.02 GHz band.

GHz

123 – 126

USA/1.16/ 178
MOD

Allocation to Services		
Region 1	Region 2	Region 3
<u>123 - 126</u>	EARTH EXPLORATION SATELLITE (passive) FIXED <u>FIXED-SATELLITE (space-to-Earth)</u> INTER-SATELLITE MOBILE MOD S5.558 <u>MOBILE-SATELLITE</u> <u>RADIONAVIGATION</u> <u>RADIONAVIGATION-SATELLITE</u> SPACE RESEARCH (passive) <u>Radio Astronomy</u> S5.138 S5.341	

Reasons: This band is not required for passive sensor operations and those allocations have been deleted. Satellite downlinks from 141-153 GHz band have been moved to the 123-130 GHz band to avoid interference to the radio astronomy service. The radio astronomy service is added on a secondary basis, for possible use in wide-band continuum observations. Sharing conditions between the ISS and the FSS, MSS, RNS and RNSS services need to be developed, but no imminent use of the band by these services is contemplated. The MSS directional indicator has been left undefined. The footnotes **S5.138** and **S5.341** do not apply to this band due to changed band limit, and are consequentially deleted.

GHz

126 – 130

USA/1.16/ 179
MOD

Allocation to Services		
Region 1	Region 2	Region 3
126 – 134 <u>130</u>	FIXED <u>FIXED SATELLITE (space-to-Earth)</u> INTER-SATELLITE MOBILE S5.558 <u>MOBILE SATELLITE</u> RADIOLOCATION S5.559 <u>RADIONAVIGATION</u> <u>RADIONAVIGATION-SATELLITE</u> <u>Radio Astronomy</u> <u>MOD S5.554</u>	

Reasons: Satellite downlinks from 141-153 GHz band have been moved to the 123-130 GHz band to avoid interference to the radio astronomy service. The radio astronomy service is added on a secondary basis for spectral line and wide-band continuum observations. The fixed, mobile, inter-satellite and radiolocation allocations have been relocated to improve sharing situations. Sharing conditions between the FSS, MSS, RNS and RNSS services need to be developed, but no imminent use of the band by these services is contemplated. The MSS directional indicator has been left undefined. The footnote **S5.554** has been modified to include this band.

GHz

130 – 134

USA/1.16/ 180
MOD

Allocation to Services		
Region 1	Region 2	Region 3
<u>130</u> – 134	FIXED INTER-SATELLITE MOBILE MOD S5.558 <u>RADIO ASTRONOMY ADD S5.RAS</u> RADIOLOCATION S5.559	

Reason: The addition of a radio astronomy allocation, footnote **S5.RAS**, and **RES RAS** satisfies the requirements for radio astronomy spectral line and wide band continuum observations from remote locations world-wide. Sharing conditions between the RAS and the ISS need to be developed. Footnote **S5.558** is modified to reflect new mobile service band limit. Radiolocation service has been relocated, to improve sharing conditions.

GHz

134 – 136

USA/1.16/ 181
MOD

Allocation to Services		
Region 1	Region 2	Region 3
134 – 142 136	<u>AMATEUR</u> <u>AMATEUR-SATELLITE</u> MOBILE S5.553 MOBILE-SATELLITE RADIONAVIGATION RADIONAVIGATION SATELLITE <u>Radio Astronomy</u> Radiolocation S5.149 S5.340 S5.554 S5.555	

Reasons: The amateur and amateur-satellite services are moved here from 142-144 GHz band to avoid interference to radio astronomy at higher frequencies. Radio astronomy is added as secondary service. All footnotes are deleted, as they no longer apply to this band.

GHz

136 – 141

USA/1.16/ 182
MOD

Allocation to Services		
Region 1	Region 2	Region 3
<u>136 – 141</u>	MOBILE S5.553 MOBILE-SATELLITE <u>RADIO ASTRONOMY ADD S5.RAS</u> <u>RADIOLOCATION</u> RADIONAVIGATION RADIONAVIGATION SATELLITE <u>Amateur</u> <u>Amateur-Satellite</u> Radiolocation MOD S5.149 S5.340 S5.554 S5.555	

Reasons: Services currently allocated to 144 -149 GHz band are moved to this band to facilitate realignment. The addition of a radio astronomy allocation, footnote **S5.RAS**, and **RES RAS** satisfies the requirements for radio astronomy spectral line and wide band continuum observations from remote locations worldwide. This band added to those listed under **S5.149**. Since this band is no longer passive, it is removed from **S5.340**. The footnote **S5.554** no longer applies to this band and is deleted. Footnote **S5.555** no longer needed, as the radio astronomy service is allocated on a primary basis in the entire 136-141 GHz band.

GHz

141 – 148.5

Allocation to Services			
	Region 1	Region 2	Region 3
USA/1.16/ 183 MOD	<u>141</u> – 142	FIXED MOBILE S5.553 MOBILE SATELLITE <u>RADIO ASTRONOMY ADD S5.RAS</u> <u>RADIOLOCATION</u> RADIONAVIGATION RADIONAVIGATION SATELLITE Radiolocation MOD S5.149 S5.340 S5.554 S5.555	
	142 – 144	AMATEUR AMATEUR SATELLITE <u>FIXED</u> <u>MOBILE</u> <u>RADIO ASTRONOMY ADD S5.RAS</u> <u>RADIOLOCATION</u> MOD S5.149	
USA/1.16/ 184 MOD			
USA/1.16/ 185 MOD	144 – 149 <u>148.5</u>	FIXED MOBILE <u>RADIO ASTRONOMY ADD S5.RAS</u> <u>RADIOLOCATION</u> Amateur Amateur-Satellite MOD S5.149 S5.555	

Reasons: Allocations are transferred to the 141-148.5 GHz band from the 126-134 GHz band to allow for radio astronomy allocations in this band. The bandwidth has been reduced to 7.5 GHz to accommodate EES (passive) and SR (passive) requirements in the 148.5-151.5 GHz band. The addition of a radio astronomy allocation, footnote **S5.RAS**, and **RES RAS** satisfies the requirements for radio astronomy spectral line and wide band continuum observations from remote locations worldwide. Since the 141-142 GHz sub-band is no longer passive, **S5.340** is deleted from that band and modified accordingly. All sub-bands are added to those listed under **S5.149**. Footnotes **S5.554** and **S5.555** no longer apply to any portion of this band and are deleted and modified accordingly.

GHz

148.5 – 151.5

Allocation to Services			
	Region 1	Region 2	Region 3
USA/1.16/ 186 MOD	<u>148.5</u> – 149	<u>EARTH EXPLORATION-SATELLITE (passive)</u> <u>RADIO ASTRONOMY</u> RADIOLOCATION <u>SPACE RESEARCH (passive)</u> Amateur Amateur Satellite S5.149 MOD S5.340 S5.555	
USA/1.16/ 187 MOD	149 – 150	<u>EARTH EXPLORATION-SATELLITE (passive)</u> FIXED FIXED SATELLITE (space to Earth) MOBILE <u>RADIO ASTRONOMY</u> <u>SPACE RESEARCH (passive)</u> <u>MOD S5.340</u>	
USA/1.16/ 188 MOD	150 – 151	EARTH EXPLORATION-SATELLITE (passive) FIXED FIXED SATELLITE (space to Earth) MOBILE <u>RADIO ASTRONOMY</u> SPACE RESEARCH (passive) S5.149 MOD S5.340 S5.385	
USA/1.16/ 189 MOD	151 – <u>151.5</u>	<u>EARTH EXPLORATION-SATELLITE (passive)</u> FIXED FIXED SATELLITE (space to Earth) MOBILE <u>RADIO ASTRONOMY</u> <u>SPACE RESEARCH (passive)</u> <u>MOD S5.340</u>	

Reasons: The current passive allocation of 150-151 GHz has insufficient bandwidth for remote sensing observations and is not adequately protected from potential interference. The scientific requirement is for a 3 GHz band centered at 150 GHz for use in conjunction with water vapour observations around 183 GHz. Also, the 150.74 GHz nitrous oxide line at required for microwave limb sounding applications. All active services are relocated from this band to meet these requirements. Since the 148.5-151.5 GHz band is now purely passive, it is added

to those listed under **S5.340**. For the same reason, there is no need to include the band 150-151 GHz in **S5.149**, and it is deleted from this footnote. The footnotes **S5.385** (150-151 GHz band) and **S5.555** (148.5-149 GHz band) are no longer needed and are deleted from these bands.

GHz
151.5 – 155.5

**USA/1.16/ 190
MOD**

Allocation to Services		
Region 1	Region 2	Region 3
<u>151.5 – 156.5</u>	FIXED FIXED-SATELLITE (space-to-Earth) MOBILE <u>RADIO ASTRONOMY ADD S5.RAS</u> <u>RADIOLOCATION</u> <u>MOD S5.149</u>	

Reasons: The FSS downlink allocation is incompatible with radio astronomy requirements in this band and is relocated elsewhere. The addition of a radio astronomy allocation, footnote **S5.RAS**, and **RES RAS** satisfies the requirements for radio astronomy spectral line and wide band continuum observations from remote locations worldwide. This band is added to those listed under footnote **S5.149**. The additional radiolocation allocation compensates for removal from the 126-134 GHz band.

GHz
155.5 – 158.5

Allocation to Services			
	Region 1	Region 2	Region 3
USA/1.16/ 191 MOD	<u>155.5 – 156</u>	<u>EARTH EXPLORATION-SATELLITE (passive) ADD S5.AAA</u> <u>FIXED ADD S5.BBB</u> <u>FIXED-SATELLITE (space to Earth)</u> <u>MOBILE ADD S5.BBB</u> <u>RADIO ASTRONOMY ADD S5.RAS</u> <u>SPACE RESEACH (passive) ADD S5.CCC</u> <u>MOD S5.149</u>	
	156 – 158	<u>EARTH EXPLORATION-SATELLITE (passive) ADD S5.AAA</u> <u>FIXED ADD S5.BBB</u> <u>FIXED-SATELLITE (space to Earth)</u> <u>MOBILE ADD S5.BBB</u> <u>RADIO ASTRONOMY ADD S5.RAS</u> <u>SPACE RESEACH (passive) ADD S5.CCC</u> <u>MOD S5.149</u>	
	158 – 164<u>158.5</u>	<u>EARTH EXPLORATION-SATELLITE (passive) ADD S5.AAA</u> <u>FIXED ADD S5.BBB</u> <u>FIXED-SATELLITE (space to Earth)</u> <u>MOBILE ADD S5.BBB</u> <u>RADIO ASTRONOMY ADD S5.RAS</u> <u>SPACE RESEACH (passive) ADD S5.CCC</u> <u>MOD S5.149</u>	

Reasons: The scientific requirement is for a 3 GHz band centered at 157 GHz for use in conjunction with water vapour observations around 183 GHz. This allocation is only required until 2018 since current planned and operational instruments are already in this band. By 2018, all of these applications will have transitioned to the 148.5-151.5 GHz band. The FSS downlink allocation is incompatible with radio astronomy requirements and is relocated. The addition of a radio astronomy allocation, footnote **S5.RAS**, and **RES RAS** satisfies the requirements for radio astronomy spectral line and wide band continuum observations from remote locations worldwide. These sub-bands are added to those listed under **S5.149**. EES operations in the band 155.5-158.5 GHz need to be protected until 1/1/2018. After this date the fixed and mobile services need to co-ordinate with radio astronomy sites only. The space research (passive) allocation is limited to space-based radio astronomy in this band.

GHz

158.5 – 164

**USA/1.16/ 194
MOD**

Allocation to Services		
Region 1	Region 2	Region 3
158.5 – 164	FIXED FIXED-SATELLITE (space-to-Earth) MOBILE <u>MOBILE-SATELLITE (space-to-Earth)</u>	

Reasons: Mobile-satellite allocation has been added to partially compensate for loss of 134-142 GHz band.

GHz

164 – 167

**USA/1.16/ 195
MOD**

Allocation to Services		
Region 1	Region 2	Region 3
164 – 168	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) <u>MOD S5.340</u>	

Reasons: Passive sensors require only this 3 GHz band from the current 164-168 GHz passive allocation. It is essential to maintain the 164 - 167 GHz portion of the band passive. The **MOD** refers to the band limits and addition of the band to footnote **S5.340** only, no change (**NOC**) is proposed to the allocations within this sub-band. This band, along with the band 148.5-151.5 GHz will become the harmonised reference window for passive sensor observations of the 183.31 GHz water vapor line. The band is also used for microwave limb sounding of the 164.38 GHz ClO line. This passive band has been added to those listed under **S5.340**; the 164-168 GHz band had been omitted from **S5.340**.

GHz

167 – 174.8

Allocation to Services			
	Region 1	Region 2	Region 3
USA/1.16/ 196 MOD	<u>167 – 168</u>	EARTH EXPLORATION SATELLITE (passive) <u>FIXED</u> <u>FIXED-SATELLITE (space-to-Earth)</u> <u>INTER-SATELLITE</u> <u>MOBILE MOD S5.558</u> RADIO ASTRONOMY SPACE RESEARCH (passive)	
	168 – 170	FIXED <u>FIXED-SATELLITE (space-to-Earth)</u> <u>INTER-SATELLITE</u> MOBILE MOD S5.558	
	170 – 174.5	FIXED <u>FIXED-SATELLITE (space-to-Earth)</u> INTER-SATELLITE MOBILE MOD S5.558 S5.149 – S5.385	
	USA/1.16/ 199 MOD	<u>174.5 – 176.54.8</u> EARTH EXPLORATION SATELLITE (passive) FIXED INTER-SATELLITE MOBILE MOD S5.558 SPACE RESEARCH (passive) S5.149 – S5.385	

Reasons: Passive services do not need the 167-168 GHz band and this band is yielded to displaced active services. Fixed, mobile and inter-satellite services are added to the 167-174.8 GHz band as well as fixed-satellite downlinks to the 167-174.5 GHz band to compensate for deletions in other bands. Passive sensor allocations are deleted from the 174.5-174.8 GHz band to properly adjust the band edge for the 183.3 GHz remote sensing requirement. Footnotes **S5.149** and **S5.385** are deleted from these bands and are appropriately modified. Footnote **S5.558** is added next to mobile allocations in this band and the footnote is modified to include the 167-174.8 GHz band due to sharing with the inter-satellite service.

GHz
174.8 – 191.8

Allocation to Services			
	Region 1	Region 2	Region 3
USA/1.16/ 200 MOD	174.58 – 176.5	EARTH EXPLORATION-SATELLITE (passive) FIXED INTER-SATELLITE <u>ADD S5.YYY</u> MOBILE S5.558 SPACE RESEARCH (passive) S5.149 – S5.385	
USA/1.16/ 201 MOD	176.5 – 182	<u>EARTH EXPLORATION-SATELLITE (passive)</u> FIXED INTER-SATELLITE <u>ADD S5.YYY</u> MOBILE S5.558 <u>SPACE RESEARCH (passive)</u> S5.149 – S5.385	
USA/1.16/ 202 MOD	182 – 185	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) MOD S5.340 – S5.563	
USA/1.16/ 203 MOD	185 – 190	<u>EARTH EXPLORATION-SATELLITE (passive)</u> FIXED INTER-SATELLITE <u>ADD S5.YYY</u> MOBILE – S5.558 <u>SPACE RESEARCH (passive)</u> S5.149 – S5.385	
USA/1.16/ 204 MOD	190 – 200<u>191.8</u>	<u>EARTH EXPLORATION-SATELLITE (passive)</u> MOBILE – S5.553 MOBILE SATELLITE RADIONAVIGATION RADIONAVIGATION SATELLITE <u>SPACE RESEARCH (passive)</u> S5.341 – S5.554 MOD S5.340	

Reasons: The band 174.8-191.8 GHz is of crucial importance for passive sensing of the water vapour absorption line whose peak is at 183.31 GHz. Sharing with fixed and mobile services is not practical, so these services are relocated. The inter-satellite service needs to be limited to links between GSO satellites and to a pfd limit as specified in sharing studies. Footnote **S5.YYY** is added to reflect this

requirement. The entire band is deleted from those listed under **S5.149**, **S5.385** (secondary radio astronomy allocation). All applicable footnotes are appropriately modified. Since no terrestrial radio astronomy use of the band 182-185 GHz is possible due to high atmospheric absorption, the radio astronomy allocation is deleted. Active services are moved from the 190-191.8 GHz band to make room for the addition of passive sensor allocations. The footnote **S5.554** is deleted from this band, to reflect removal of active services, and modified to reflect this change. **S5.341** does not apply to this band and is deleted. The footnote **S5.340** has been modified to include this band.

GHz

191.8 – 200

**USA/1.16/ 205
MOD**

Allocation to Services		
Region 1	Region 2	Region 3
<u>191.8 – 200</u>	<u>FIXED MOD S5.553</u> <u>INTER-SATELLITE</u> MOBILE MOD S5.553 MOBILE-SATELLITE RADIONAVIGATION RADIONAVIGATION-SATELLITE S5.341 MOD S5.554	

Reasons: Inter-satellite and fixed service allocations added to compensate for deletions from other bands. The footnotes **S5.553** and **S5.554** modified to reflect deletion of terrestrial services from 190.0 -191.8 GHz band, and to include stations in the fixed service, allocated to the 191.8-200 GHz band.

GHz
200 – 209

Allocation to Services			
	Region 1	Region 2	Region 3
USA/1.16/ 206 MOD	200 – 202	EARTH EXPLORATION-SATELLITE (passive) FIXED MOBILE <u>RADIO ASTRONOMY</u> SPACE RESEARCH (passive) <u>MOD S5.340 S5.341</u>	
	202 – 21709	<u>EARTH EXPLORATION-SATELLITE (passive)</u> FIXED FIXED-SATELLITE (Earth-to-space) MOBILE <u>RADIO ASTRONOMY</u> <u>SPACE RESEARCH (passive)</u> <u>MOD S5.340 S5.341</u>	

Reasons: This band is the optimum band for microwave limb sounding of water vapour and other atmospheric constituents in the low troposphere. Fixed and mobile services as well as the fixed-satellite uplink in the 202-209 GHz band are all relocated to meet this requirement. Footnote **S5.340** is consequentially modified, to include this band. A radio astronomy allocation has been added to satisfy the requirement for radio astronomy spectral line and wide band continuum observations.

GHz

209 – 217

**USA/1.16/ 208
MOD**

Allocation to Services		
Region 1	Region 2	Region 3
<u>209 – 217</u>	FIXED FIXED-SATELLITE (Earth-to-space) MOBILE <u>RADIO ASTRONOMY</u> <u>ADD S5.RAS</u> <u>MOD S5.149</u> S5.341	

Reasons: The addition of a radio astronomy allocation, footnote **S5.RAS**, and **RES RAS** satisfies the requirements for radio astronomy spectral line and wide band continuum observations from remote locations world-wide. This band has been added to those listed under **S5.149**.

GHz

217 – 226

**USA/1.16/ 209
MOD**

Allocation to Services		
Region 1	Region 2	Region 3
<u>217 – 226</u>	EARTH EXPLORATION SATELLITE (passive) <u>FIXED</u> <u>FIXED-SATELLITE (Earth-to-space)</u> <u>MOBILE</u> RADIO ASTRONOMY SPACE RESEARCH (passive) <u>ADD S5.CCC</u> <u>MOD S5.149</u> S5.340 S5.341	

Reasons: Passive sensors do not need this band and the EESS allocation is deleted. Fixed and mobile services and fixed-satellite uplinks are moved to this band from other locations. This band is no longer passive; consequentially it now needs to be listed under footnote **S5.149**. This band has been removed from footnote **S5.340** and footnote **S5.340** has been deleted from this band.

GHz

226 – 231.5

Allocation to Services			
	Region 1	Region 2	Region 3
USA/1.16/ 210 MOD	226 – 231	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) ADD S5.CCC MOD S5.340 S5.341	
	231 – 231.5	<u>EARTH EXPLORATION-SATELLITE (passive)</u> FIXED FIXED-SATELLITE (space-to-Earth) MOBILE <u>RADIO ASTRONOMY</u> <u>SPACE RESEARCH (passive) S5.CCC</u> Radiolocation <u>MOD S5.340 S5.341</u>	

Reasons: It is essential to maintain the 226-231.5 GHz band passive. The **MOD** refers to the band limits only; no change (**NOC**) is proposed to the allocations within this sub-band. Passive sensors require exclusive use of only the 226-231.5 GHz portion of the 217-231 GHz band for microwave limb sounding of atmospheric constituents. In addition, this band contains a 4 GHz reference window for higher frequency water vapor measurements. This band is of vital importance to the radio astronomy service for observations of the 230.5 GHz CO line. The footnote **S5.340** is modified to take into account that 217-226 GHz band is no longer passive, while adding the 231-231.5 GHz band. The fixed and mobile services, as well as the fixed-satellite downlinks, have been deleted from the 231-231.5 GHz portion to allow passive observations in this band.

GHz

231.5 – 235

Allocation to Services			
	Region 1	Region 2	Region 3
USA/1.16/ 212 MOD	231.5 – 235	FIXED FIXED-SATELLITE (space-to-Earth) MOBILE Radiolocation	

Reasons: The only required change in this band is the 500 MHz upward adjustment of the lower band edge (see the previous modification).

GHz

235 – 238

**USA/1.16/ 213
MOD**

Allocation to Services		
Region 1	Region 2	Region 3
235 – 238	EARTH EXPLORATION-SATELLITE (passive) FIXED FIXED-SATELLITE (space-to-Earth) MOBILE <u>RADIO ASTRONOMY ADD S5.RAS</u> SPACE RESEARCH (passive)	

Reasons: Passive sensors are limited to microwave limb sounding in the band 235-238 GHz and can share with terrestrial services due to the absorption characteristics of this band. The fixed-satellite downlink is not compatible with the radio astronomy requirement for this band and is reallocated elsewhere. The addition of a radio astronomy allocation, footnote **S5.RAS**, and **RES RAS** satisfies the requirements for radio astronomy spectral line and wide band continuum observations from remote locations world-wide.

GHz

238 – 241

**USA/1.16/ 214
MOD**

Allocation to Services		
Region 1	Region 2	Region 3
238 – 241	FIXED FIXED-SATELLITE (space-to-Earth) MOBILE <u>RADIOLOCATION</u> <u>RADIONAVIGATION</u> <u>RADIONAVIGATION-SATELLITE</u> Radiolocation	

Reasons: Additional allocations to the radiolocation, radionavigation and radionavigation-satellite services, to compensate for allocation changes in the 150-160 GHz frequency range.

GHz

241 – 248

**USA/1.16/ 215
MOD**

Allocation to Services		
Region 1	Region 2	Region 3
241 – 248	RADIOLOCATION <u>RADIO ASTRONOMY ADD S5.RAS</u> Amateur Amateur-Satellite S5.138 MOD S5.149	

Reasons: The addition of a radio astronomy allocation, footnote **S5.RAS**, and **RES RAS** satisfies the requirements for radio astronomy spectral line and wide band continuum observations from remote locations world-wide. This band is added to those listed under footnote **S5.149**. There is no change in sharing between existing services, except for the introduction of the radio astronomy service allocation in band.

GHz

248 – 250

**USA/1.16/ 216
MOD**

Allocation to Services		
Region 1	Region 2	Region 3
248 – 250	AMATEUR AMATEUR-SATELLITE <u>Radio Astronomy</u>	

Reasons: The radio astronomy service allocation is added on a secondary basis.

GHz

250 – 252

**USA/1.16/ 217
MOD**

Allocation to Services		
Region 1	Region 2	Region 3
250 – 252	EARTH EXPLORATION-SATELLITE (passive) SPACE RESEARCH (passive) <u>RADIO ASTRONOMY</u> S5.149—S5.555 MOD S5.340	

Reasons: Microwave limb sounding of nitrous oxide near 251 GHz defines the passive-sensing requirement for this band. Radio astronomy is added to the other passive services. The addition of another passive service does not alter sharing scenario. The footnotes **S5.149** and **S5.555** are consequentially deleted and band lists in these footnotes are appropriately modified. The footnote **S5.340** is added to reflect the passive nature of band.

GHz
252 – 265

**USA/1.16/ 218
MOD**

Allocation to Services		
Region 1	Region 2	Region 3
252 – 265	<u>FIXED MOD S5.553</u> MOBILE MOD S5.553 MOBILE-SATELLITE (Earth-to-space) RADIONAVIGATION RADIONAVIGATION-SATELLITE <u>RADIO ASTRONOMY ADD S5.RAS</u> MOD S5.149 S5.385—S5.554 —S5.555—S5.564	

Reasons: The fixed service is relocated to this band due to other allocation actions in other bands. The addition of a radio astronomy allocation and new footnote **S5.RAS**, along with **RES RAS** satisfy requirements for radio astronomy spectral line (current secondary allocation to radio astronomy at 257.5 - 258 GHz deleted) and wide band continuum observations from remote locations worldwide. The directional indicator added to mobile-satellite service allocation, which is paired with allocation in the 190-200 GHz band. Atmospheric absorption in the 252-265 GHz band is relatively constant and somewhat higher than in the paired downlink band. This entire band is added to those listed under footnote **S5.149**, and the band is deleted from **S5.385** and **S5.555**. The footnotes **S5.385** and **S5.555** have been modified to reflect changes. The footnote **S5.564** is no longer needed in this band due to the worldwide nature of the radio astronomy allocation.

GHz
265 – 275

**USA/1.16/ 219
MOD**

Allocation to Services		
Region 1	Region 2	Region 3
265 – 275	FIXED FIXED-SATELLITE (Earth-to-space) MOBILE RADIO ASTRONOMY <u>ADD S5.RAS</u> MOD S5.149	

Reasons: The only change is the addition of footnote **S5.RAS**, reflecting the protection requirement for only a limited number of radio astronomy sites worldwide.

GHz
275 – 400

**USA/1.16/ 220
MOD**

Allocation to Services		
Region 1	Region 2	Region 3
275 – 400 <u>1000</u>	(Not allocated) MOD S5.565	

Reasons: The change of the upper limit for applicability of footnote **MOD S5.565** is to account for various passive service needs above 275 GHz that have been identified by administrations. Many lines and windows required for radio astronomy observations and passive remote sensing of the Earth exist above 275 GHz.

**USA/1.16/ 221
MOD**

S5.149 In making assignments to stations of other services to which the bands:

13 360-13 410 kHz,	48.94-49.04 GHz*,
25 550-25 670 kHz,	72.77-72.91 GHz* ,
37.5-38.25 MHz,	<u>76.5-81.5 GHz</u>
73-74.6 MHz in	<u>81.5-84.5 GHz</u> ,
Regions 1 and 3,	<u>84.5-86 GHz</u>
150.05-153 MHz in	93.07-93.27 GHz* ,
Region 1,	<u>92-94 GHz</u> ,
322-328.6 MHz*,	<u>94.1-95 GHz</u> ,
406.1-410 MHz,	<u>95-100 GHz</u> ,
608-614 MHz in	97.88-98.08 GHz* ,
Regions 1 and 3,	<u>100-102 GHz</u> ,
1 330-1 400 MHz*,	<u>102-105 GHz</u> ,
1 610.6-1 613.8 MHz*,	<u>105-109.5 GHz</u>
1 660-1 670 MHz,	<u>111.8-114.25 GHz</u>
1 718.8-1 722.2 MHz*,	140.69-140.98 GHz*,
2 655-2 690 MHz,	<u>141-148.5 GHz</u> ,
3 260-3 267 MHz*,	<u>148.5-151.5 GHz</u>
3 332-3 339 MHz*,	144.68-144.98 GHz* ,
3 345.8-3 352.5 MHz*,	145.45-145.75 GHz* ,
4 825-4 835 MHz*,	146.82-147.12 GHz* ,
4 950-4 990 MHz,	150-151 GHz* ,
4 990-5 000 MHz,	174.42-175.02 GHz*,
6 650-6 675.2 MHz*,	177-177.4 GHz*,
10.6-10.68 GHz,	178.2-178.6 GHz*,
14.47-14.5 GHz*,	181-181.46 GHz*,
22.01-22.21 GHz*,	186.2-186.6 GHz* ,
22.21-22.5 GHz,	<u>209-226 GHz</u>
22.81-22.86 GHz*,	250-251 GHz* ,
23.07-23.12 GHz*,	257.5-258 GHz* ,
31.2-31.3 GHz,	261-265 GHz ,
31.5-31.8 GHz in	262.24-262.76 GHz* ,
Regions 1 and 3,	<u>252-265 GHz</u>
36.43-36.5 GHz*,	265-275 GHz,
42.5-43.5 GHz,	265.64-266.16 GHz* ,
42.77-42.87 GHz*,	267.34-267.86 GHz* ,
43.07-43.17 GHz*,	271.74-272.26 GHz
43.37-43.47 GHz*,	

- * are allocated (* indicates radio astronomy use for spectral line observations), administrations are urged to take all practicable steps to protect the radio astronomy service from harmful interference. Emissions from spaceborne or airborne stations can be particularly serious sources of interference to the radio astronomy service (see Nos. **S4.5** and **S4.6** and Article **S29**).

Reasons: The changes to this footnote are consequential to the changes made to the related allocations.

**USA/1.16/ 222
MOD**

S5.340 All emissions are prohibited in the following bands:

1 400 - 1 427 MHz,
2 690 - 2 700 MHz except those provided for by Nos. **S5.421** and **S5.422**,
10.68 - 10.7 GHz except those provided for by No. **S5.483**,
15.35 - 15.4 GHz except those provided for by No. **S5.511**,
23.6 - 24 GHz,
31.3 - 31.5 GHz,
31.5 - 31.8 GHz in Region 2,
48.94 - 49.04 GHz from airborne stations,
50.2 - 50.4¹ GHz except those provided for by No. **S5.555A**,
52.6 - 54.25 GHz
86 - 92 GHz,
~~105 - 116 GHz,~~
109.5 - 111.8 GHz,
114.25 - 116 GHz,
~~140.69 - 140.98 GHz — from airborne stations and from space stations in the space to-~~
~~Earth direction,~~
148.5-151.5 GHz,
164 - 167 GHz,
182 - 185 GHz except those provided for by No. **S5.563**,
190 - 191.8 GHz,
200 - 202 GHz
202 - 209 GHz
~~217 - 228 GHz,~~
226 - 231.5 GHz,
250 - 252 GHz.

Reasons: The changes to this footnote are consequential to the changes made to the related allocations.

**USA/1.16/ 223
NOC**

S5.341 In the bands 1 400 - 1 727 MHz, 101 - 120 GHz and 197 - 220 GHz, passive research is being conducted by some countries in a programme for the search for intentional emissions of extraterrestrial origin.

Reasons: This informational footnote is still accurate.

**USA/1.16/ 224
MOD**

S5.385 *Additional allocation:* the bands 1 718.8 - 1 722.2 MHz, ~~150 - 151 GHz, 174.42 - 175.02 GHz, 177 - 177.4 GHz, 178.2 - 178.6 GHz, 181 - 181.46 GHz, and 186.2 - 186.6 GHz~~ and 257.5 - 258 GHz are is also allocated to the radio astronomy service on a secondary basis for spectral line observations.

Reasons: The changes to this footnote are consequential to the changes made to the related allocations.

**USA/1.16/ 225
MOD**

S5.553 In the bands 43.5 - 47 GHz, 66 - 71 GHz, 95 - 100 GHz, ~~134 - 142 GHz, 190 - 191.8 - 200 GHz~~ and 252 - 265 GHz, stations in the fixed and land mobile service may be operated subject to not causing harmful interference to the space radiocommunication services to which these bands are allocated (see No. **S5.43**).

Reasons: The changes to this footnote are consequential to the changes made to the related allocations.

**USA/1.16/ 226
MOD**

S5.554 In the bands 43.5 - 47 GHz, 66 - 71 GHz, 95 - 100 GHz, ~~134 - 142 - 126 - 134 GHz, 190 - 191.8 - 200 GHz~~ and 252 - 265 GHz, satellite links connecting land stations at specified fixed points are also authorized when used in conjunction with the mobile-satellite service or the radionavigation-satellite service.

Reasons: The changes to this footnote are consequential to the changes made to the related allocations.

**USA/1.16/ 227
MOD**

S5.555 *Additional allocation:* the bands 48.94 - 49.04 GHz, ~~97.88 - 98.08 GHz, 140.69 - 140.98 GHz, 144.68 - 144.98 GHz, 145.45 - 145.75 GHz, 146.82 - 147.12 GHz, 250 - 251 GHz and 262.24 - 262.76 GHz~~ are is also allocated to the radio astronomy service on a primary basis.

Reasons: The changes to this footnote are consequential to the changes made to the related allocations.

**USA/1.16/ 228
MOD**

S5.556 In the bands 51.4 - 54.25 GHz, 58.2 - 59 GHz, and 64 - 65 GHz, ~~72.77 - 72.91 GHz and 93.07 - 93.27 GHz~~, radio astronomy observations may be carried out under national arrangements.

Reasons: The changes to this footnote are consequential to the changes made to the related allocations.

**USA/1.16/ 229
MOD**

S5.558 In the bands 55.78-58.2 GHz, 59-64 GHz, 66-71 GHz, ~~123 - 134~~ 122.5 - 126 GHz, 170 - 182 167 - 174.8 GHz and 185-190 GHz, stations in the aeronautical mobile service may be operated subject to not causing harmful interference to the inter-satellite service (see No. **S5.43**).

Reasons: The changes to this footnote are consequential to the changes made to the related allocation.

- USA/1.16/ 230
MOD** **S5.559** In the bands 59 - 64 GHz and ~~126 – 134 GHz~~, airborne radars in the radiolocation service may be operated subject to not causing harmful interference to the inter-satellite service (see No. **S5.43**).
- Reasons:** The changes to this footnote are consequential to the changes made to the related allocation. The radiolocation and inter-satellite services are no longer co-allocated in this spectral region.
- USA/1.16/ 231
NOC** **S5.560** In the band 78 - 79 GHz radars located on space stations may be operated on a primary basis in the earth exploration-satellite service and in the space research service.
- Reasons:** No change is required to this footnote
- USA/1.16/ 232
MOD** **S5.561** In the band ~~84 – 86~~ 74 - 76 GHz, stations in the fixed, and mobile ~~and broadcasting~~ services shall not cause harmful interference to broadcasting-satellite stations operating in accordance with the decisions of the appropriate frequency assignment planning conference for the broadcasting-satellite service.
- Reasons:** The broadcasting satellite allocation has been transferred to the 74-76 GHz band and the broadcasting and broadcasting satellite services are no longer co-allocated.
- USA/1.16/ 233
NOC** **S5.562** The use of the band 94-94.1 GHz by the earth exploration-satellite (active) and space research (active) services is limited to spaceborne cloud radars.
- Reasons:** This footnote was the result of allocation decisions made at WRC-97 and no change is needed.
- USA/1.16/ 234
SUP** ~~**S5.564** Additional allocation: in Germany, Argentina, Spain, Finland, France, India, Italy, the Netherlands and Sweden, the band 261 – 265 GHz is also allocated to the radio astronomy service on a primary basis.~~
- Reasons:** The radio astronomy allocation is now worldwide in the 261-265 GHz band, therefore a country footnote is no longer needed.
- USA/1.16/ 235
MOD** **S5.565** The frequency band 275 - 400 1000GHz may be used by administrations for experimentation with, and development of, various active and passive services. In this band a need has been identified for the following spectral line measurements for passive services:
- radio astronomy service: ~~278 – 280 GHz and 343 – 348~~ 275 - 323, 327-371, 388 - 434 GHz, 426 - 442 GHz, 453 - 510 GHz, 623 - 711 GHz, and 795 - 909 GHz
 - Earth exploration-satellite service (passive) and space research service (passive): ~~300~~294 – 3026 GHz, ~~324~~16 – 32634 GHz, ~~345~~2 – 3479 GHz, ~~363 – 365 GHz, and 379~~1 – 3849 GHz, ~~416 – 434 GHz, 442 – 444 GHz, 496 – 506 GHz, 546 – 568 GHz, 624 – 629 GHz, 634 – 654~~

GHz, 659 – 661 GHz, 684 – 692 GHz, 730 – 732 GHz, 851 – 853 GHz
and 951 – 956 GHz.

Future research in this largely unexplored spectral region may yield additional spectral lines and continuum bands of interest to the passive services. Administrations are urged to take all practicable steps to protect these passive services from harmful interference until the next competent world radio conference.

Reasons: These additional bands have been identified by various administrations as bands that will also be used for radio astronomy observations and spaceborne passive remote sensing.

USA/1.16/ 236
ADD

S5.AAA In the band 155.5 - 158.5 GHz, the allocation to the Earth exploration-satellite (passive) and space research (passive) services shall terminate on 1 January 2018.

Reasons: This allocation will not be needed by passive sensors after the termination date. By the termination date, all passive sensors will have transitioned to the 148.5 - 151.5 GHz band.

USA/1.16/ 237
ADD

S5.BBB The date of entry for the allocation to the fixed and mobile services in the band 155.5 - 158.5 GHz shall be 1 January 2018.

Reasons: Passive sensors require the use of this band until 1 January 2018.

USA/1.16/ 238
ADD

S5.CCC Use of this allocation is limited to space-based radio astronomy only.

Reasons: This band is a likely candidate for a future space based radio astronomy mission. No other space research use is contemplated.

USA/1.16/ 239
ADD

S5.DDD The 81 - 81.5 GHz band is also allocated to the amateur and amateur-satellite services on a secondary basis.

Reasons: Amateur allocation

USA/1.16/ 240
ADD

S5.EEE The band 75.5-76 GHz is also allocated to the amateur and amateur-satellite services on a primary basis until the year 200[6].

Reasons: Amateur allocation

USA/1.16/ 241
ADD

S5.YYY Use of the bands 174.8-182 GHz by the inter-satellite service is limited to satellites in the geostationary-satellite orbit. The single-entry power flux-density, at all altitudes from 0 km to 1 000 km above the Earth's surface and in the vicinity of all geostationary orbital positions occupied by passive sensors, produced by a station in the inter-satellite service, for all conditions and for all methods of modulation, shall not exceed -144 dBW/m²/MHz for all angles of arrival.

Reasons: This footnote is required to protect passive sensors operating in this band.

USA/1.16/ 242 **S5.XXX** Use of the bands 116-123 GHz by the inter-satellite service is limited to
ADD satellites in the geostationary-satellite orbit. The single-entry power flux-density,
at all altitudes from 0 km to 1 000 km above the Earth's surface and in the vicinity
of all geostationary orbital positions occupied by passive sensors, produced by a
station in the inter-satellite service, for all conditions and for all methods of
modulation, shall not exceed -148 dBW/m²/MHz for all angles of arrival.

Reasons: This footnote is required to protect passive sensors operating in this
band.

USA/1.16/ 243 **S5.RAS** Use of this band by the radio astronomy service shall be in accordance
ADD with the terms of Resolution **RAS**.

Reasons: To limit radio astronomy use of the band to coordination zones is
required to protect radio observatories, and facilitate use of the band by the other
co-allocated services.

USA/1.16/ 244
ADD

RESOLUTION RAS

USE OF THE BANDS [] BY THE RADIO ASTRONOMY SERVICE

The World Radiocommunication Conference (Istanbul, 2000),

considering

- a) that a large number of spectral lines of astrophysical interest above 71 GHz
provide unique information about cosmic processes, such as the chemistry of the
interstellar medium and the formation of stars and planets, and that this
information cannot be obtained from any other source;
- b) that Doppler shifted lines, which are also of great interest for astronomical
studies, are found far removed from the rest frequency of some spectral lines and
that highly Doppler shifted lines may offer the only means to obtain information
about the very early Universe and the formation of galaxies;
- c) that mm-wave radio astronomy receivers are designed to cover substantial
portions of the atmospheric windows above 70 GHz to take advantage of the
information contained in spectral lines, as well as in continuum radiation;
- d) that several Administrations operate mm-wave radio astronomy
observatories and that some are building or are planning to build a limited number
of large new facilities to exploit the most advanced technologies; and that these
facilities are intended to serve the needs of the worldwide scientific community;
- f) that mm-wave observatories must be located on high mountain tops or
plateaus to take advantage of the driest possible atmospheric conditions necessary

to obtain high quality observations; and require substantial investments on behalf of the scientific communities concerned, and that therefore their number will remain low,

noting

that sharing between the radio astronomy service and other terrestrial services operating in bands above 71 GHz is facilitated by the natural attenuation provided by atmospheric gases, and that it can be further facilitated by adequate geographic separation,

urges:

Administrations to establish coordination zones around mm-wave radio astronomy sites operating in bands above 71 GHz. Coordination zone radii should be determined following the procedure outlined in Rec. ITU-R RA.1031-1, separately for ground based transmitters, airborne transmitters and transmitters that may be located on High Altitude Platforms (HAPS).

resolves:

1. that in the frequency bands referred to in this Resolution, co-primary status of the radio astronomy service shall be recognized within coordination zones established by Administrations. No coordination requirements should be imposed upon terrestrial services outside established coordination zones.
2. that in the bands referred to in this Resolution, co-primary services operating stations within a coordination zone should coordinate their operations with affected radio astronomy stations within five years of the date of notification of the radio astronomy site to the Radiocommunication Bureau

Annex 1 lists the radio astronomy sites that operate, or plan to operate in the bands referred to in this Resolution as of [June 8, 2000]. Observatories that operate only up to 92 GHz are identified with *** under the SITE column.

USA/1.16/ 245
MOD

[Annex 1]*

**List of Radio Astronomical Observatories Operating
in Bands Above 71 GHz**

REGION 1

COUNTRY	SITE	LONG o ' "	LAT o ' "	ALT (m)	DIAM (m)	Remarks
Finland	Metsahovi	24 23 17	60 13 04	61	13.7	
France	Bordeaux	-00 31 37	44 50 10	73	2.5	
	Plateau de Bure ²	05 54 26	44 38 01	2552	15	
Germany	Effelsberg	06 53 00	50 31 32	369	100	
Italy	Medicina***	11 38 43	44 31 14	44	32	EVLBI
	Noto***	15 03 00	36 31 48			EVLBI
Russia	Zelenchuiskaya	41 26 30	43 39 12	2100		
Spain	Pico Veleta	-03 23 34	37 03 58	2870	30	
	Robledo	-04 14 57	40 25 38	761		
	Yepes	-03 06 00	40 31 30	931		
Turkey	Gebse-Kocaeli	29 26 52	40 47 06	200		

* ALL OF ANNEX 1 SHOULD BE CONSIDERED IN []

REGION 2

COUNTRY	SITE	LONG. o ' "	LAT. o ' "	ALT (m)	DIAM (m)	REMARKS
Chile	San Pedro de Atacama	67 44 00	-23 02	5000		MMA (planned) ³
	La Silla	70 44 04	-29 15 34	2300	15	
	Las Campanas	70 41 10	-29 01 43	2440	4	SEST
	Pampa La Bola	67 42 00	-22 58 00	4800		LMSA (planned) ⁴
Mexico	Sierra Negra	97 18 00	18 59 00	4500	50	Large Millimeter Telescope (LMT-under construction)

The Observatoire de Plateau de Bure interferometer consists of 3 antennas of 15 m diameter.

³ The USA MMA (MilliMeter Array) will consist of 40 antennas of 8-m diameter, on a ring configuration.
The diameter of the ring will be capable of variation, ranging from 80 m to 10 km across.

⁴ The Japanese LMSA (Large Southern Millimeter Array) will consist of 50 antennas of 10-m diameter.

COUNTRY	SITE	LONG. o ' "	LAT. o ' "	ALT (m)	DIAM (m)	REMARKS
USA	Green Bank, WVA ***	79 50 24	38 25 59	946	100	NRAO-GBT
	Socorro, NM ***	107 37 06	34 04 44	2155	25	NRAO-VLA ⁵

	St. Croix, VI ***	64 35 01	17 45 24	46	25	NRAO VLBA ⁶
	Hancock, NH ***	71 59 12	42 56 01	340	25	NRAO VLBA
	North Liberty, IO ***					NRAO VLBA
	Ft. Davis, TX ***	91 34 27	41 46 17	272	25	NRAO VLBA
	Los Alamos, NM ***	103 56 41	30 38 06	1646	25	NRAO VLBA
	Pie Town, NM ***	106 14 44	35 46 31	1997	25	NRAO VLBA
	Kitt Peak, AZ ***	108 07 09	34 18 04	2402	25	NRAO VLBA
	Owens Valley, CA ***	111 36 45	31 57 23	1946	25	NRAO VLBA
	Brewster, WA ***	118 16 37	37 13 54	1237	25	NRAO VLBA
	Mauna Kea, HI ***	119 41 00	48 07 52	286	25	NRAO VLBA

	Kitt Peak, AZ	155 27 19	19 48 05	3751	25	NRAO VLBA
	Amherst, MA	NRAO 12 m
	Owens Valley, CA	111 36 50	31 57 10	1930	12	FCRAO (Five Colleges Obs.)
	Hat Creek, CA	72 20 40	42 23 33	314	13.7	Caltech ⁷
	Westford, MA	118 17 36	37 13 54	1236	10.4	BIMA ⁸
	Mauna Kea, HI	121 28 24	40 49 04	1042	6.1	Haystack Obs.
	Mauna Kea, HI	71 29 19	42 37 23	122	36	J.C. Maxwell Tel. CSO
	Mauna Kea, HI	155 28 20	19 49 33	4000	10.4	

⁵ The VLA consists of 27 antennas of 25-m diameter, arranged in a Y pattern up to 36 km across.

⁶ The VLBA consists of 10 antennas of 25 m diameter, distributed across the continental US, Hawaii and the US Virgin Islands

⁷ The Caltech Interferometer consists of 3 antennas of 10.4 m diameter

⁸ The BIMA (Berkeley-Illinois-Maryland Array) currently consists of 9 antennas of 6.1-m diameter. The final configuration will consist of 11 antennas.

REGION 3

COUNTRY	SITE	LONG. o ' "	LAT. o ' "	ALT. m	DIAM m	REMARKS
AUSTRALIA	Parkes Mopra Narrabri, NSW	148 15 44 149 05 58 149 32 56	-33 00 00 -31 16 04 -30 59 52	60	64	Austr. Tel. Compact Array
CHINA	Delingha	97 43 75	37 22 43	3200	13.7	
JAPAN	Nobeyama ⁹ Kashima Mizusawa Nagoya Mt. Fuji Kagoshima	138 28 32 140 39 46 141 08 09 136 58 24 138 45 06 130 26 32	35 56 29 35 57 15 39 08 00 35 08 55 35 21 30 31 44 52	1350 50 87 70 3776 520	45 34 10 4 1.2 20	Comm. Res. Lab. Only >300GHz VERA (planned)
KOREA	Taejon	127 22 18	36 23 54	120	13.7	

Other

COUNTRY	SITE	LONG. o ' "	LAT. o ' "	ALT. m	DIAM m	REMARKS
	ANTARCTICA		-90 00 00			

Reasons: The footnote **S5.RAS** limits radio astronomy use of the band to coordination zones required to protect radio observatories. **RES RAS** sets out the details of the limitation on the radio astronomy service. Annex 1 lists the observatories that operate in the radio astronomy service in bands shared with terrestrial services above 71 GHz at the time of WRC-00.

⁷ The Nobeyama site includes a 45 m diameter telescope, an interferometer that consists of 6 antennas of 10 m diameter, and a 60 cm diameter submillimeter telescope.

Proposals for Agenda Item 1.17

to consider possible worldwide allocation for the earth exploration-satellite (passive) and space research (passive) service in the band 18.6 - 18.8 GHz, taking into account the results of the ITU-R studies

Proposal for earth exploration-satellite (passive) and the space research (passive) services in the band 18.6 - 18.8 GHz on a primary in Regions 1 and 3 (20March99)

Background Information: At present, the allocations for the Earth exploration-satellite (passive) and the space research (passive) services in the band 18.6 - 18.8 GHz are on a primary basis in Region 2, but on a secondary basis in Regions 1 and 3. This allocation must be upgraded to primary status if the long-term ability to obtain environmental data with passive spaceborne sensors is to be preserved. Compatibility between the passive sensors and the fixed and fixed-satellite services requires adoption of constraints on the parameters of the fixed and fixed-satellite systems that use the band. A pfd limit of -95 dBW/m² in a reference bandwidth of 200 MHz on geostationary systems in the fixed-satellite service will enable passive sensors to perform their mission if measurements are restricted to portions of the sensor orbit where the sensor is moving away from the equator while taking sensor data over land masses. Limiting the power delivered to any antenna of a station in the fixed service measured across the band 18.6 - 18.8 GHz band to not exceed 0 dBW along with an antenna pattern complying with Recommendation ITU-R F.699-4 will enable sharing with the fixed service.

Proposal:

GHz 18.6 – 18.8

USA/1.17/246
MOD

Allocation to Services		
Region 1	Region 2	Region 3
18.6 – 18.8 <u>EARTH EXPLORATION-SATELLITE (passive)</u> FIXED FIXED-SATELLITE (space-to-Earth) MOD S5.523 MOBILE except aeronautical mobile Earth Exploration-Satellite (passive) Space Research (passive) MOD S5.522	18.6 – 18.8 EARTH EXPLORATION-SATELLITE (passive) FIXED FIXED-SATELLITE (space-to-Earth) MOD S5.523 MOBILE except aeronautical mobile SPACE RESEARCH (passive) MOD S5.522	18.6 – 18.8 <u>EARTH EXPLORATION-SATELLITE (passive)</u> FIXED FIXED-SATELLITE (space-to-Earth) MOD S5.523 MOBILE except aeronautical mobile Earth Exploration-Satellite (passive) Space Research (passive) MOD S5.522

Reasons: To establish a common worldwide primary allocation to the Earth exploration-satellite (passive) services to be used for environmental measurements.

USA/1.17/247
MOD

~~S5.522 In making assignments to stations in the fixed and mobile services, administrations are invited to take account of passive sensors in the Earth exploration-satellite and space research services operating in the band 18.6 - 18.8 GHz. In this band, administrations should endeavour to limit as far as possible both the power delivered by the transmitter to the antenna and the e.i.r.p. in order to reduce the risk of interference to passive sensors to the minimum. In the band 18.6 - 18.8 GHz, fixed and mobile service stations shall be limited to a total power delivered to each antenna of 0 dBW.~~

Reasons: To enable passive sensors and the fixed service to operate in the band without excessive interference to the sensors.

USA/1.17/248
MOD

~~S5.523 In assigning frequencies to stations in the fixed-satellite service in the direction space-to-Earth, administrations are requested to limit as far as practicable the power flux density at the Earth's surface in the band 18.6-18.8 GHz, in order to reduce the risk of interference to passive sensors in the earth-exploration-satellite and space research services. In the band 18.6 - 18.8 GHz, the fixed-satellite service shall be limited to a power flux density at the Earth's surface of -95 dBW/m² in a reference bandwidth of 200 MHz for all angles of arrival.~~

Reasons: To enable passive sensors and the fixed-satellite service to operate in the band without excessive interference to the sensors.

Proposals for Agenda Item 1.18

to consider the use of new digital technology for the maritime mobile service in the band 156-174 MHz and consequential revision of Appendix **S18**, taking into account Resolution **342** (WRC-97)

Proposal for the modification of Appendix S18 (31July99)

Background Information: Appendix **S18** of the ITU Radio Regulations defines the channels of the maritime mobile service. These channels support a variety of functions including “Distress, Safety and Calling: public correspondence, inter-ship, ship/shore/ship, port operations and ship movement”. The maritime mobile frequency band, 156-174 MHz, (effectively 156-162 MHz in the U.S. due to previous domestic regulatory actions), supports maritime communications worldwide.

WP8B and the CPM studied this agenda item and determined that the status of the ITU-R studies indicate that revisions of Appendix **S18** to introduce new digital technologies is not possible at this conference. However, it is possible to take action to address the issue of congestion.

With the rapidly increasing use of the VHF maritime mobile band, particularly for data communications, increased congestion and mutual interference is being experienced which, among others, has resulted in unacceptable degradation of the distress and safety related function for which this band is utilized. Unless action is taken this situation will only worsen as usage continue to grow.

At WRC-97, the United States and CITEL proposed simplex use of duplex channels for Appendix **S18**. This was approved for a few specific public correspondence channels only, channels 18 and 82-86. Note M to Appendix **S18** must be modified to add more channels for simplex use. This will allow for more efficient use of Appendix **S18** channels and provide flexibility for administrations to meet their immediate requirements, while maintaining compatibility with the vast number of ships and pleasure craft now using the band in accordance with Appendix **S18**.

WP8B and the CPM recommend modifications to Appendix **S18** to provide administrations with further flexibility to use the channels of Appendix **S18** in simplex mode if required. This would allow the use of duplex channels in Appendix **S18** in simplex mode and would increase the number of available channels. The cost of the change would be minimal and administrations could be able to quickly address certain local problems of congestion.

The United States proposes to modify Note M to allow simplex use of duplex channels for the remainder of the channels not already identified as simplex.

The United States proposes to modify Resolution **342** to allow consideration of one or more new interoperable technologies, for the maritime mobile service.

Proposal:

APPENDIX S18

USA/1.18/ 249
MOD

**Table of transmitting frequencies in the VHF
maritime mobile band**

(See Article S52)

NOTE – For assistance in understanding the Table, see notes *a)* to *n)* below.

Channel Designator	Notes	Transmitting frequencies (MHz)		Inter- ship	Port operations and ship movement		Public corres- pondence
		Ship stations	Coast stations		Single frequency	Two frequency	
16		156.800	156.800	DISTRESS, SAFETY AND CALLING			
76	<i>n)</i>	156.825			x		
17	<i>g)</i>	156.850	156.850	x	x		
77		156.875		x			
18	<i>m)</i>	156.900	161.500		x	x	x
78	<i>m)</i>	156.925	161.525		x	x	x
19	<i>m)</i>	156.950	161.550		x	x	x
79	<i>m)</i>	156.975	161.575		x	x	x
20	<i>m)</i>	157.000	161.600		x	x	x
80	<i>m)</i>	157.025	161.625		x	x	x
21	<i>m)</i>	157.050	161.650		x	x	x
81	<i>m)</i>	157.075	161.675		x	x	x
22	<i>m)</i>	157.100	161.700		x	x	x
82	<i>m)</i>	157.125	161.725		x	x	x
23	<i>m)</i>	157.150	161.750		x	x	x
83	<i>m)</i>	157.175	161.775		x	x	x
24	<i>m)</i>	157.200	161.800		x	x	x
84	<i>m)</i>	157.225	161.825		x	x	x
25	<i>m)</i>	157.250	161.850		x	x	x
85	<i>m)</i>	157.275	161.875		x	x	x
26	<i>m)</i>	157.300	161.900		x	x	x
86	<i>m)</i>	157.325	161.925		x	x	x
27	<i>m)</i>	157.350	161.950		x	x	x
87		157.375			x		
28	<i>m)</i>	157.400	162.000		x	x	x
88		157.425			x		
AIS 1	<i>l)</i>	161.975	161.975				
AIS 2	<i>l)</i>	162.025	162.025				

Notes referring to the Table

Specific notes

m) These channels (~~18 and 82 to 86~~) may be operated as single frequency channels, subject to special arrangement between interested or affected administrations.

Reasons: Adding more channels for simplex use will allow for more efficient use of Appendix **S18** channels and provide flexibility for administrations to meet their immediate requirements, while maintaining compatibility with the vast number of ships and pleasure craft now using the band in accordance with Appendix **S18**.

USA/1.18/ 250
MOD

RESOLUTION 342 (WRC-97~~2000~~)

Review of new technology to provide improved efficiency in the use of the band 156-174 MHz by stations in the maritime mobile service

USA/1.18/ 251
MOD

The World Radiocommunication Conference (~~Geneva, 1997~~Istanbul, 2000),

considering

USA/1.18/ 252
MOD

- a) that the agenda of ~~WRC-97~~ this conference includes~~d~~ the consideration of the use of Appendix **S18** to the Radio Regulations in respect of maritime mobile communications and the use of new technology for maritime radiotelephony channels;
- b) Recommendation **318 (Mob-87)**;
- c) that Appendix **S18** identifies frequencies to be used for distress and safety communications on an international basis;
- d) that the introduction of new technology in the maritime mobile service shall not disrupt distress and safety communications in the VHF band including those established by the International Convention for the Safety of Life at Sea (SOLAS), 1974, as amended;
- e) that ITU-R is conducting studies on improving efficiency in the use of this band, and that these studies are still ongoing;
- f) that changes made in Appendix **S18** should not prejudice the future use of these frequencies or the capabilities of systems or new applications required for use by the maritime mobile service;
- g) that the congestion on Appendix **S18** frequencies calls for the implementation of efficient new technologies;

h) that the use of new technology on maritime VHF frequencies will make it possible to better respond to the emerging demand for new services,

noting

USA/1.18/ 253
SUP

~~*a)* that some administrations are considering adopting some of the above changes to their operations within the Appendix S18 frequencies;~~

USA/1.18/ 254
ADD

a) that digital systems have been successfully implemented in portions of the land mobile service,

USA/1.18/ 255
ADD

b) that the use of mobile telephones (PCS and Cellular) along the coast had led to the reduced use of maritime public correspondence systems,

resolves

USA/1.18/ 256
MOD

a) that ~~WRC-99~~ a future World Radiocommunication Conference should consider the use of new technology in the band 156-174 MHz and consequential revision of Appendix S18 if necessary;

USA/1.18/ 257
ADD

b) that in order to provide full worldwide interoperability of equipment on ships, there should be one technology or more than one interoperable worldwide technology implemented in Appendix S18;

invites ITU-R

USA/1.18/ 258
MOD

to continue studies on the following with a view to providing a report to ~~WRC-99~~ a future WRC and identify the future requirements of the maritime mobile service. If the requirements warrant the replacement of existing technology with new technology then:

USA/1.18/ 259
SUP

~~*a)* — to identify the future requirements of the maritime mobile service;~~

~~*b)*~~ *a)* to identify suitable technical characteristics of the system or interoperable systems to replace existing technology;

USA/1.18/ 260
MOD

~~*e)*~~ *b)* to identify necessary modifications if required, to the frequency plan contained within Appendix S18;

USA/1.18/ 261
MOD

~~*d)*~~ *c)* to recommend a timetable for the introduction of new technology if required, and a transition plan ~~the necessary changes~~;

USA/1.18/ 262
MOD

~~*e)*~~ *d)* to study and recommend how new technology can be introduced without harming the distress and safety requirements,

instructs the Secretary-General

to communicate this Resolution to the International Maritime Organization.

Reasons: These modifications do not restrict the new technology to digital or to one technology; all available technologies should be studied, as new technologies are constantly emerging. It is spectrally inefficient to set aside spectrum, which is already extremely congested, for a new technology that has not yet been determined.

Proposals for Agenda Item 1.20

to consider the issues related to the application of Nos. **S9.8**, **S9.9** and **S9.17** and the corresponding parts of Appendix **S5** with respect to Appendices **S30** and **S30A**, with a view to possible deletion of Articles **6** and **7** of Appendices **S30** and **S30A**, also taking into consideration Recommendation **35 (WRC-95)**

Proposal to relax the PFD limit in Section 5c of Annex 1 of Appendix S30 (17June99)

Background Information: Annex 1 to Appendix **S30** of the Radio Regulations specifies limits for determining whether a service is affected by a proposed modification to the BSS Plan or when it is necessary to seek the agreement of any other administration. Section 5 of Annex 1 specifies limits to the change in the PFD to protect the terrestrial services of administrations in Regions 1 and 3 from modifications to the Region 2 Plan.

Section 5c specifies the PFD limits for administrations in Region 1 east of longitude 30°E. This PFD limit is very tight at low angles of elevation. In order to meet this PFD limit the Region 2 BSS spacecraft EIRP towards Alaska must be significantly lower compared to the continental United States. As a result the provision of BSS service to Alaska, from U.S. orbital assignments at 101W, 110W and 119W, requires larger BSS receive dishes, in some cases as large as 1.8 m. This will also be the case for Region 2 administrations that propose to modify their assignments to provide service to the United States. The US Administration requires provision of service to Alaska when technically feasible.

A relaxation in the PFD limit in Section 5c of Annex 1 of Appendix **S30**, as proposed below, would allow the use of 60 cm BSS receive dishes in Alaska for BSS service from the 101W, 110W and 119W orbital locations.

It is noted that a Joint Rapporteur Group between JWP 10/11S and WP 9D has been established to evaluate the power flux density limits specified in Section 5c and perhaps other terrestrial power flux density limits in Annex 1 of Appendix **S30**.

Proposal:

APPENDIX S30

ANNEX 1

".....5. Limits to the change in the power flux-density to protect the terrestrial services of administrations in Regions 1 and 3¹⁶

- | | |
|----------------------------|--|
| USA/1.20/01
MOD | c) in the frequency band 12.2-12.7 GHz for territories of administrations in Region 1 ¹⁷ , east of longitude 30° E: |
|----------------------------|--|

¹⁶ See § 3.18 of Annex 5.

¹⁷ In the band 12.5-12.7 GHz in Region 1, these limits are applicable only to the territory of administrations mentioned in Nos. **S5.494** and **S5.496**.

$$\begin{aligned}
& -134 \text{ dB(W/m}^2\text{/5 MHz)} \quad \text{for } \gamma \leq 0.85^\circ; \\
& -134 + 4.6975 \gamma^2 \text{ dB(W/m}^2\text{/5 MHz)} \quad \text{for } 0^\circ < \gamma \leq 0.8^\circ; \\
& -128.5 + 25 \log \gamma \text{ dB(W/m}^2\text{/5 MHz)} \quad \text{for } \gamma > 0.85^\circ;
\end{aligned}$$

Reasons: To allow the provision of BSS service to all of Alaska using 60 cm receive dishes, from the U.S. BSS assignments at 101W, 110W and 119W and from other Administration's orbital locations who plan to provide BSS service to the United States.

Proposals for the Work of the Conference

role of the notifying administration when acting as the notifying administration on behalf of a named group of administrations

Proposal concerning Resolution 87 (Minneapolis, 1998)(21July99)

**USA/1.18/ 263
SUP**

NOC The Administration of the United States, in particular as the notifying administration for INTELSAT, has considered any possible modifications to the Radio Regulations under Resolution **87**. This Administration has not experienced any difficulties either with other administrations acting as the notifying administration for a group of named administrations or acting as the notifying administration for INTELSAT. The Administration of the United States believes that the Radio Regulations are now adequate in this area and require no changes regarding the responsibilities of the notifying administration. The notifying administration and the intergovernmental organizations should retain the flexibility of making their own arrangements for interfaces with the ITU. Members of an intergovernmental organization responsible for satellite networks can best determine how it needs to comply with the Radio Regulations.

Reasons: The current Radio Regulations are adequate

Proposals for the Work of the Conference

review and update of the advance publication, coordination and notification procedures

Proposal for Resolution 86 (Minneapolis, 1998) (21July99)

Background Information:

1. Resolution **86** (Minneapolis, 1998) resolves to request WRC-2000 and subsequent WRCs to continually review and update the advance publication, coordination and notification procedures, including the associated technical characteristics, and the related Appendices of the Radio Regulations, so as to ensure that they reflect the latest technologies, as well as to achieve additional simplification and cost savings for the Radiocommunication Bureau and administrations.

Discussion

2. One enabler facilitating coordination and associated resolution of difficulties is timely availability of information to all parties concerned. For this reason, the Radio Regulations have contained a provision (currently No. **S9.38**) calling for the publication of complete coordination information in the Weekly Circular within four months of receipt by the BR. Unfortunately, that timely publication has not been possible; currently, the publication backlog is on the order of twenty months.
3. While we are hopeful that incentives will emerge from review of the process by administrations to promote improvements in the satellite procedures, it seems doubtful that substantial reductions in the backlog and processing delays will be realized without fundamental process changes that must be established in the Radio Regulations by WRCs.
4. One such change centers on the idea that complete examination (by the BR) of coordination requests might occur in parallel with the review undertaken by administrations. This would reduce the actions to be undertaken by the BR *before* it initially publishes a coordination request, and should make the information available to administrations much earlier. This can be the starting point for a series of changes to Article **S9**. It is desired to make the process practical for the BR and meaningful to administrations. The fundamental responsibility of the BR to examine and publish coordination requests is retained, with some revision of the associated time frames.
5. Examples of a two-step coordination publication procedure are given. For the first coordination publication, there would be minimal examination by the Radiocommunication Bureau (completeness of data, conformity with the Table of Allocations and conformity with the bringing into use provisions of the Radio Regulations). The second publication would present the results of the Bureau's technical and coordination examinations that may be subject to a further comment if additional administrations are identified as affected or if technical information in the first publication needed modification to be in compliance with the Regulations.

ARTICLE S9
Procedure for effecting coordination with or
Obtaining agreement of other administrations

USA/S9/264
NOC

Section II – Procedure for effecting coordination
Sub-section IIA – Requirement and request for coordination

USA/S9/265
NOC

S9.34 On receipt of the complete information sent under No. **S9.30** or No. **S9.32** the Bureau shall promptly:

USA/S9/266
MOD

S9.35 *a)* examine that information with respect to its conformity with the Table of Frequency Allocations and No. **S11.3144**;

USA/S9/267
SUP

S9.36 *b)* identify in accordance with No. **S9.27** any administration with which coordination may need to be effected;

USA/S9/268
SUP

S9.36.1. The list of administrations identified by the Bureau under Nos. **S9.11** to **S9.14** and **S9.21** is only for information purposes, to help administrations comply with this procedure

USA/S9/269
SUP

S9.37 *c)* include their names in the publication under No. **S9.38**;

Reason: relocating provisions **S9.36** through **S9.37** to after **ADD S9.39**

USA/S9/270
MOD

S9.38 *b~~d~~*) publish, as appropriate, the complete information in the Weekly Circular within four months of receipt. When the Bureau is not in a position to comply with the time limit referred to above, it shall periodically so inform the administrations, giving the reasons therefore.

USA/S9/271
ADD

S9.38.1 When the coordination information is communicated at the same time as the advance publication information, the effective date of receipt of the coordination information is established pursuant to **S9.1**.

Reason: to establish an initial publication of coordination data upon examination for completeness, making the data available earlier than in the current process, while allowing the BR to continue carrying out the technical review and identification of affected administrations.

USA/S9/272
(ADD)

S9.38A If the information is found to be incomplete, the Bureau shall immediately seek from the administration concerned any clarification required and information not provided

Reason: Move of provision from **S9.40A** to maintain sequence of events.

USA/S9/273
(ADD)

S9.39 Thereafter, with respect to the information referred to in No. **S9.34**, the Bureau shall promptly:

USA/S9/274 (ADD)	S9.39A <i>a)</i> identify in accordance with No. S9.27 any administration with which coordination may need to be effected
USA/S9/275 (ADD)	S9.39A.1 The list of administrations identified by the Bureau under Nos. S9.11 to S9.14 and S9.21 is only for information purposes, to help administrations comply with this procedure.
USA/S9/276 (ADD)	S9.39B <i>b)</i> complete its examination with respect to other provisions of these regulations referred to in No. S11.31 .
USA/S9/277 (ADD)	S9.39C <i>c)</i> publish, as appropriate, the additional information in S9.39A and S9.39B , including any necessary modifications to the data in the initial publication under S9.38 .
USA/S9/278 (ADD)	<p>S9.39C.1 The Bureau may publish the information under No. S9.39C concurrent with the relevant publication under No. S9.38 when such action does not result in a delay of the No. S9.38 publication beyond the time limit given in No. S9.38. In any event, the Bureau shall publish the information under No. S9.39C within four months of the publication under No. S9.38; when the Bureau is not in a position to comply with this time limit, it shall periodically inform the administrations, giving the reasons therefor.</p> <p>Reason: S9.39-S9.39C reintroduce provisions formerly at S9.36-S9.38 and to provide BR with the option to publish this information concurrent with the original data if the initial publication under No. S9.38 is not delayed.</p>
USA/S9/279 (MOD)	S9.40 <i>ed)</i> inform the administrations concerned of its actions and communicate the results of its calculations, drawing attention to the relevant Weekly Circular.
USA/S9/280 (SUP)	<p>S9.40A</p> <p>Reason: Provision moved to ADD S9.38A.</p>
USA/S9/281 MOD	<p>S9.41 Following receipt of the Weekly Circular published pursuant to No. S9.39C and referring to requests for coordination under Nos. S9.7 to S9.9, an administration believing that it should have been included in the request shall, within four months of the date of publication of the relevant Weekly Circular inform the initiating administration and the Bureau, giving its technical reasons for doing so, and shall request that its name be included.</p> <p>Reason: The revised process provides for the BR to publish its analysis of administrations affected <i>after</i> the initial publication under No. S9.38. This modification ensures that administrations have at least 4 months to reply after the BR publishes its analysis.</p>

- USA/S9/282
MOD** **S9.42** The Bureau shall study ~~this~~ the information from commenting administrations on the basis of Appendix **S5** and shall inform both administrations of its conclusions. Should the Bureau agree to include the administration in the request, it shall publish an addendum to the publication under No. **S9.39C**
- Reason:** Consequential renumbering, and to clarify provision.
- USA/S9/283
NOC** **S9.43** Those administrations not responding under No. **S9.41** within the time limits specified therein shall be regarded as unaffected and the provisions of Nos. **S9.48** and **S9.49** shall apply.
- USA/S9/284
NOC** **S9.50** An administration having received a request for coordination under Nos. **S9.7** to **S9.21**, or having been included in the procedure following action under No. **S9.41**, shall promptly examine the matter with regard to interference which may be caused to or, in certain cases, by its own assignments¹⁵, identified in accordance with Appendix **S5**¹⁶.
- USA/S9/285
NOC** ¹⁵ **S9.50.1**
- USA/S9/286
NOC** ¹⁶ **S9.50.2**
- USA/S9/287
(MOD)** **S9.51** Following its action under No. **S9.50**, the administration with which coordination was sought under Nos. **S9.7** to **S9.9** shall, within four months of the date of publication of the Weekly Circular under No. **S9.3839C**, either inform the requesting administration and the Bureau of its agreement or act under No. **S9.52**.
- USA/S9/288
NOC** **S9.51A** Following its action under No. **S9.50**, the administration with which coordination was sought under Nos. **S9.15** to **S9.19** shall, within four months of the date of dispatch of the coordination data under No. **S9.29**, either inform the requesting administration of its agreement or act under No. **S9.52**.
- USA/S9/289
(MOD)** **S9.52** If an administration, following its action under No. **S9.50**, does not agree to the request for coordination, it shall, within four months of the date of publication of the Weekly Circular under No. **S9.3839C**, or of the date of dispatch of the coordination data under No. **S9.29**, inform the requesting administration of its disagreement and shall provide information concerning its own assignments upon which that disagreement is based. It shall also make such suggestions as it is able to offer with a view to satisfactory resolution of the matter. A copy of that information shall be sent to the Bureau. Where the information relates to terrestrial stations or earth stations operating in the opposite direction of transmission within the coordination area of an earth station, only that information relating to existing radiocommunication stations or to those to be brought into use within the next three months for terrestrial stations, or three years for earth stations, shall be treated as notifications under Nos. **S11.2** or **S11.9**.

USA/S9/290
NOC

S9.52A In the case of coordination requested under No. **S9.14**, on receipt of the special section of the Weekly Circular referred to in No. **S9.38**, and within the same four-month period from the publication of that special section, an administration in need of assistance may inform the Bureau that it has existing or planned terrestrial stations which might be affected by the planned satellite network, and may request the Bureau to determine the need for coordination by applying the Appendix **S5** criteria. The Bureau shall inform the administration seeking coordination of this request, indicating the date by which it may be able to provide the results of its analysis. When these results are available, the Bureau shall inform both administrations. This request shall be considered as a disagreement, pending the results of the analysis by the Bureau of the need for coordination.
